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NOTICES.—All communications relating to editorial matter should be addressed to the Editor, who will be pleased to consider articles or contributions dealing with modern chemical developments or suggestions bearing upon the advancement of the chemical industry in this country. Communications relating to advertisements or general matters should be addressed to the Manager.

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French Traffic in German Dyestuffs

IT has been known for some time among British dyestuff manufacturers and merchants—and the British authorities have had their attention drawn to the fact—that French colour firms have been offering for sale in this country large quantities of German dyestuffs, apparently consisting of recently seized stocks in the Ruhr or of reparation colours in excess of French home requirements, at prices out of all relation to costs of production. As an example of this traffic we have before us now a communication received this week from a French colour firm, accompanied by a detailed list of stocks of no fewer than 893 kinds of German dyestuffs, described as either Meister Lucius or Badische standard colours or more generally as German standard colours. Fortunately, owing to the existence of the Dyestuffs Act, it is one thing for our French friends to offer these cheap German dyestuffs for sale in this country and quite another for the buyer to obtain a licence to import.

This unrestricted French "dumping" of German dyestuffs at non-economic prices, if it were to be permitted, would penalise three distinct British interests. First, and most important, it would tend to undermine the British dyestuff-manufacturing industry, on which so much money, research, and effort have been expended in order to secure for this country independence of foreign supplies. Secondly, the *bona fide* British importing house which carries on the legitimate business of representing German and other foreign firms and is able to supply such German colours as are still required would suffer too. It is possible that yet another sufferer would be the user, for the quality of dyestuffs in their passage through many hands has sometimes been found to deteriorate appreciably. The Dyestuffs Act now makes it impossible for the home market to be flooded and the home industry undermined by promiscuous importation of this sort, and the Dyestuffs Licensing Committee, in granting licences for the importation of German colours, may be trusted to restrict such licences as far as possible to responsible British firms who are able to secure such German colours as this country still requires direct from the German producers, with the producing firms' own guarantee of the standard of purity and concentration.

The Year's Chemical Trade

THE publication of the Board of Trade Returns for December is particularly interesting, because figures are given showing not only the trade of the month but that of the year as a whole. The figures relate, of course, to imports and exports, which may be taken as a very fair indication, in most cases, of the general trade situation. Certainly these figures are of value for the chemical trade, and it is satisfactory to note, therefore, that 1923 was a distinctly better year than 1922, both for trade as a whole and also for chemicals. The imports under the heading "chemicals, dyes, drugs and colours" in 1923 were valued at, roughly, 13 million pounds sterling—an increase of two millions on the previous year's figures, and also above those for 1921. The exports under the same heading indicate a greater proportionate increase of nearly 5½ millions—from £20,300,000 in 1922 to £25,700,000 in 1923. It may be noted that in 1921 the figure was £19,100,000. This is particularly satisfactory from the point of view of the British manufacturer, as these figures relate entirely to home-produced goods. It may be mentioned, in passing, that re-exports of foreign or colonial chemical products are of an annual value of about £1,000,000 only, and that this has shown a slight decrease, which is also a hopeful sign for the British industry. The improvement would appear to have taken place largely during the past four months, as in the earlier part of last year the conditions were somewhat fluctuating, but since the summer conditions have been considerably better. The figures for December are also much more favourable than those for the corresponding month last year.

It might perhaps be expected that this improvement had affected some products in preference to others, but in imports the change is very well distributed, and

in exports, in addition to an all-round increase, there is a particularly marked improvement in the case of chemicals derived from coal. This group, taken in its broadest sense, includes sulphate of ammonia, benzol, the whole range of "crudes," and synthetic dyes. Attention has frequently been drawn to the increase in these products revealed in the monthly statistics, and during the year this has amounted to 65 per cent. in the total value of sulphate of ammonia exported and over 100 per cent. in the large class of coal tar crudes. In coal tar dyestuffs there has been a reduction in prices during the year, so that the percentage increase in the value of the exports is about 69 per cent., although the quantity has increased by 168 per cent., which represents a mean price reduction of 37 per cent. No items in the export tables show any appreciable decrease. In view of these satisfactory figures, it is clear that 1923 has shown a steady improvement over the previous period of depression, and it is to be hoped that this improvement foreshadows more prosperous conditions in the near future.

Chemical Control in Industry

DR. ELLWOOD HENDRICK, a well-known character in the Chemists' Club, New York, author of the *Percolator Papers*, a series of short essays full of worldly wisdom and literary charm, in the first chapter of his amusing and practical book, *Everyman's Chemistry*, dwells on the value the advice of the skilled chemist has for the manufacturer. "The time is soon coming," he writes, "when manufacturing establishments will need a chemist in consultation just as much as they need a lawyer now. If they are negotiating with customers or with other corporations, they need a lawyer to draw their contracts and see that they do not make mistakes. If they are negotiating with materials, they need a chemist, for chemistry treats of the ways of stuff, and these are full of unexpected turnings. Chemical control is needed. There should be a chemist on the board of every corporation that has to do with chemical processes. He should be a man of attainment, of distinction, and of backbone."

He is speaking to Americans. His book is written to inform the public. Professor H. E. Armstrong, in addressing the Yorkshire members of the Institution of Civil Engineers, at Sheffield, before Christmas, used a similar argument. We gather from a notice of his address in *The Gas World* that he was not only thinking of the chemist but of skilled advisers in whatever direction a particular enterprise might need technical control. Speaking of the low temperature carbonisation of coal in particular, he complained that the "inventor" had been charged too exclusively with the conduct of the enterprise; he referred, however, to the practice as more or less general. As he implied, the time is past to talk of the advantages to be gained from the use of a smokeless fuel, whether as a means of diminishing fog or of economising fuel. What we have to do is to make the stuff. The Professor told how no gas-tight retort has thus far been constructed, and fully recognised how great are the difficulties to be overcome in constructing one. Many will sympathise with his desire that a concerted scientific effort should be made to solve a problem of outstanding public importance.

Cyanides From Spent Oxide

ALTHOUGH processes for the recovery of cyanogen compounds from spent oxide of iron have been known and practised for some years they have never received any great attention in this country, for the reason that it is somewhat questionable whether the value of the recovered products leaves any surplus over the expenditure entailed in recovering them, apart from which, of course, the market for cyanide compounds is a restricted one. On the Continent the matter is viewed rather differently, and quite a number of distinct recovery processes are in operation, although it is generally believed that there is plenty of room for improvement from the economic point of view. Broadly speaking, the systems used fall into two distinct groups, namely, those in which the free sulphur is first extracted by means of a solvent and those in which the oxide is straightway treated for the recovery of the cyanogen. The latter processes are chiefly in use, and consist, in the main, of the lixiviation of the material for the removal of soluble salts, such as ammonium compounds and sulphocyanides, the whole of the cyanogen being finally recovered as potassium ferrocyanide.

Recently a method which appears to strike out on a somewhat new line has been introduced in Germany, the object being the recovery of both sulphur and cyanogen compounds while leaving the oxide in a condition which permits of its re-use for absorption purposes. The process consists in treating the spent material with a hot solution of the sulphides or polysulphides of alkaline earths, the polysulphide liquor formed being subsequently decomposed with sulphurous acid. In this way a mixture is obtained which consists of sulphur and the sulphites of alkaline earths, while the cyanide compounds remain in solution in the form of their earth-alkali salts from which they may be worked up. Separation of sulphur from sulphite follows by treatment with acid, and sulphurous acid is formed which in turn is used in the process. The method is not without interest, and from figures which the inventors give it would seem that it shows no little promise from the commercial point of view.

Four Points about Unemployment

WRITING from Pontresina to *The Times* this week, Sir Ernest Benn usefully directs attention to four fundamental causes of unemployment which deserve to be considered quite apart from current political considerations. The first and most potent is "the perverted mentality" not only of the workers, but of the nation as a whole, as a result of which people have come to regard a "job" as an end in itself instead of as a piece of reciprocal social service. The second cause is found in the "restrictions and limitations" on output and other forms of industrial activity, which push up prices for the ever-diminishing few who can afford to pay and inflict a cruel punishment on the many, whether consumers or workers, who are thus robbed of comforts or work. The third cause is the popular impression, largely the result of false political teaching, that it is always the duty of somebody else to provide people with work or maintenance. "This deception," Sir Ernest says truly, "has been too widely practised of late, and the false feeling of comfort derived from it

is manufacturing unemployment wholesale." The fourth and last cause is high taxation—in which everyone with personal experience of taxation will heartily agree. The taxation of any income, he argues, depletes the wages fund and creates unemployment, but the heavy taxation of big incomes, popular as it may be, hits the labour market worst of all. The view is frankly and courageously expressed that "it is on the men of great wealth that all communities rely to put in motion the machinery of trade and commerce. Whatever may be said or thought about great accumulations of riches, it cannot be denied that they possess the power to promote employment on a big and effective scale. Punitive taxation of such wealth, for which much theory can be advanced, has the undoubted practical effect of reducing the most important power on which we have hitherto relied for our industrial development."

Cantor Lectures

THE Royal Society of Arts may be congratulated on the excellent course of lectures arranged for the 170th Session, covering January to March. On January 21 Dr. Eric Rideal will deliver the first instalment of his Cantor Lecture on "Colloid Chemistry," the second and third instalments being fixed respectively for January 28 and February 4. The second Cantor Lecture of the session, also in three instalments, will be by Mr. E. V. Evans, and is entitled "A Study of the Destructive Distillation of Coal." Mr. Evans's lectures will be on February 25, March 3, and March 10. In addition, Sir R. A. S. Paget will deal on January 30 with "The History, Development and Commercial Uses of Fused Silica"; Sir R. M. Dane on February 15 with "Salt Manufacture in India and China"; Mr. P. J. Burgess on February 20 with "New Uses for Rubber"; and Mr. Campbell Swinton on March 12 with "Personal Recollections of Some Notable Scientific Men."

Books Received

DIE ESSIGSÄURE. By Dr. Viktoria Kessler. Berlin: M. Krayn. Pp. 118. 2s. 6d.

ALLEN'S COMMERCIAL ORGANIC ANALYSIS. Vol. I. London: J. and A. Churchill. Pp. 796. 30s.

DIE PRAXIS DES EISENHÜTTENCHEMIKERS. By Dr. Carl Krug, Berlin: Julius Springer. Pp. 200. $14.5.

MARINE PRODUCTS OF COMMERCE. By Donald K. Tressler. New York: The Chemical Catalog Co., Inc. Pp. 762. $9·00.

DIZIONARIO DI MERCEOLOGIA E DI CHIMICA APPLICATA. Vol. II.—Damiana—Mussena. Milan: Ulrico Hœpli. Pp. 805. L. 35.

QUANTITATIVE CHEMICAL ANALYSIS. By Frank Clowes and J. Bernard Coleman. London: J. and A. Churchill. Pp. 576. 18s.

THE INSTITUTE OF CHEMISTRY OF GREAT BRITAIN AND IRELAND.—Report of the Conference held at Liverpool, October 18-20, 1923.

THE ELECTRONIC THEORY OF VALENCY.—A general discussion held by the Faraday Society. London: The Faraday Society. Pp. 94. 10s. 6d.

GENERAL CHEMISTRY. By Horace G. Deming. New York: John Wiley and Sons, Inc. London: Chapman and Hall, Ltd. Pp. 606. 17s. 6d.

THE PHYSICAL CHEMISTRY OF THE PHOTOGRAPHIC PROCESS.—A general discussion held by the Faraday Society. London: The Faraday Society. Pp. 166. 12s. 6d.

REPORT OF THE FOOD INVESTIGATION BOARD FOR THE YEAR 1922. By the Department of Scientific and Industrial Research. London: H.M. Stationery Office. Pp. 60. 1s. 6d.

Points from Our News Pages

Dr. Chatterji, of the Government Technical Institute, Cawnpore, discusses the bearing of research in colloid chemistry on the refining and saponification of oils and fats (p. 56).

Figures are taken from the Board of Trade returns showing the increase in chemical overseas trade, both for December last and for the whole year (p. 59).

In a statistical article on British dyestuffs in overseas markets a correspondent contrasts the position in 1913 with the position to-day (p. 60).

The hearing of the claim by Dr. Levinstein and Professor Green, in respect of mustard gas, was continued in the Law Courts on Monday, when Professor Green's cross-examination was completed and the claimants' case closed (p. 62).

In a paper on "Fractional Distillation," Messrs. C. Elliott and A. Brittain emphasise the need of more scientific data (p. 63).

Mr. P. R. Koekkoek, in a paper before the Oil and Colour Chemists' Association, dealt with "Chromes from the Consumer's Point of View," and urged manufacturers to pay more attention to the needs of users (p. 64).

In the Chancery Division on Thursday the hearing was begun of an action by the Secretary of the Castner-Kellner Co. to restrain the Gas Light and Coke Co. from the manufacture of certain chemicals (p. 68).

According to our London Market Report business has been moderately active during the week (p. 74).

There has been little improvement in the Scottish Chemical Market, but fair inquiry for export however (p. 77).

The Calendar

21	University of Birmingham Chemical Society: Presidential Address—Professor G. T. Morgan. 5.30 p.m.	University, Birmingham.
21	Royal Society of Arts: Cantor Lecture—"Colloid Chemistry." Dr. E. K. Rideal. 8 p.m.	John Street Adelphi, London.
21	Chemical Industry Club: "The Manufacture of Cables." Dr. W. R. Ormandy. 8 p.m.	2, Whitehall Court, London, S.W.1.
22	Northern Polytechnic Institute Chemical Association: "The Founders of Physical Chemistry." Dr. G. Senter. 8 p.m.	Holloway, London
22	Hull Chemical and Engineering Society: "The Testing of Materials." G. F. O'Riordan.	Hull Photographic Society's Rooms, Park Street, Hull.
23	Society of Chemical Industry (Nottingham Section): "The Microscope as an Aid to Analysis." W. Woodhouse and S. R. Trotman. 7.30 p.m.	University College, Nottingham.
24	Society of Dyers and Colourists (West Riding Section) "Water Treatment of Boiler Feed Purposes." D. Brownlie.	
25	Society of Chemical Industry (Glasgow Section), Joint Meeting with the Institute of Chemistry. Paper by F. W. Harris. 7.15 p.m.	39, Elmbank Crescent, Glasgow.
26	West Yorkshire Metallurgical Society: "Use of Scrap Metals." G. Lodgard. 3 p.m.	Technical College, Bradford.
28	Royal Society of Arts: Cantor Lecture II, "Colloid Chemistry." Dr. E. K. Rideal. 8 p.m.	John Street, Adelphi, London.
29	Society of Dyers and Colourists (Leeds Junior Branch): "Works Filtration." Dr. Forster.	Leeds.
30	Royal Society of Arts: "The History, Development and Commercial Uses of Fused Silica," Sir R. A. Surtees Paget. 8 p.m.	John Street, Adelphi, London.

Colloid Chemistry in the Technology of Oils and Fats

By N. G. Chatterji, D.Sc., A.I.C.

Dr. Chatterji, who is in the Department of Oil Technology, Government Technical Institute, Cawnpore, India, discusses the bearing of recent research in colloid chemistry on the refining of oils and fats, on glycerides which undergo a chemical change without being saponified, and on the saponification of oils and fats.

THE principles of colloid chemistry are of such wide application that a general review of the subject with reference to the main industries connected with oils and fats will not be without interest to students or manufacturers. But these industries are so numerous that a comprehensive survey of these is not possible in the course of a few pages. It has therefore been thought advisable to consider only the more important industries, classifying them after Lewkowitsch under the following heads :—

A.—Industries having for their object the refining of oils and fats and their application to commercial uses.

B.—Industries in which the glycerides undergo a chemical change but are not saponified.

C.—Industries based on the saponification of oils and fats.

For the purposes of this paper, Ostwald's conception of the colloid has been adopted, namely, any substance can be made to assume the colloidal state if the magnitude of most of its particles is between certain limits. If the particles grow larger than these they are said to pass on to the suspensoid state ; on the other hand, if the size becomes smaller they pass on to the molecular state. Hence the properties usually associated with colloids are really the properties which any substance acquires due to its particles being of a certain size. There must therefore be, for the existence of colloids, at least two phases, one—the continuous phase, in which the other, the disperse phase, is distributed throughout in the finely-divided state. The phases may be solids, liquids or gases, and it is not at all necessary that both of them should be in different physical conditions.

The properties associated with the colloidal state are numerous, but the two most important ones are the Brownian movement and the electrical charge borne by the particles. The Brownian movement is a kind of peculiar incessant motion of particles when their size is sufficiently small. It is this motion which is supposed to help small particles to remain indefinitely suspended in a medium against the action of gravity. If through any cause the particles grow bigger in size, the movement ceases, and coagulation is said to take place.

The electrical charge borne by colloids may be positive or negative, and is specific for a given substance in a given continuous medium. A very slight alteration in the condition of the latter, for example, the addition of a small amount of an electrolyte, may alter the character of the charge. All the other familiar phenomena connected with colloids, such as cataphoresis, endosmosis, coagulation, and peptisation are more or less related to the electric charge carried by the colloids. Thus a strong electromotive force subjected on a colloidal solution brings about the movement of the particles towards the oppositely charged pole, resulting in the phenomenon of cataphoresis. Coagulation may be considered as the aggregation of several colloidal particles due to the neutralisation of their charges. The opposite phenomenon, namely, the increase of charge of coarser particles resulting in disintegration, or the partial coagulation of molecular particles, both of which give rise to colloidal particles, is known as peptisation. We are here not concerned with the origin of the charge on colloids, but it would simplify matters if we assume that the change in the charge of the particles is primarily brought about by the adsorption of ions by the colloids. This brief resumé of colloids and their properties will help us considerably in the scientific study of the industries connected with oils and fats.

We shall now take up the various industries according to the classification given above.

A.—Refining of Fats and Oils

The refining of fats and oils for edible purposes constitutes one of the most important branches of the oil industry, and presents peculiar opportunities for the study and application of colloid chemistry. The chief attention in the refinery is paid to the removal of the free fatty acids, for which purpose treatment with alkali or alkaline earths is almost exclusively used. The importance of the alkali treatment of oils is not generally recognised, for besides the neutralisation of the free acid, the soap formed serves to remove the other impurities from the oil in many ways. The researches of Professor McBain have shown that in fairly strong solutions, soap gives, what have been termed ionic micelles having peculiar properties. These are formed by the aggregation of a number of simple negative ions, so as to form a single particle carrying the total charge of the individual ions. Now this enormous aggregation of electric charges serves to form the nucleus for the condensation of the greater part of colloidal suspended impurities present in the oil. In fact the soap acts in much the same way as an electrolyte does in bringing about the coagulation of an aqueous colloid. The great effectiveness of soap in clearing up a quantity of oil is due to its thorough incorporation with it, and the heavily charged particles which it presents for the coagulation of the impurities. Such highly charged particles cannot be furnished by any ordinary electrolyte. Again, since comparatively strong solutions of soaps give these ionic micelles a strong solution of an alkali (usually six per cent.) is generally found to be much more efficient than a weak one.

The use of a solution sodium silicate may also be explained in the same way. The sodium silicate solution undergoes hydrolysis, producing sodium hydroxide and colloidal silicic acid. The former produces soap and acts in the manner explained above, aided by the latter, which has strong powers of adsorbing many colouring matters and not a few odoriferous substances.

The filtration of oil for purification through beds of animal charcoal, fuller's earth, and like substances, is based upon their power to adsorb small amounts of colouring matters. It is a curious fact that the action of these substances is in many cases specific, that is, for a particular oil a particular substance acts much better than the others. The subject has not been scientifically studied ; some insight into the matter may be obtained by making cataphoretic experiments with the oils under various conditions of acidity and alkalinity, with these adsorbents in suspension. The colouring matters present in oils are mostly of a colloidal type, and as such are electrically charged. Their removal would be most effective on the addition of that substance which acquires a heavy opposite charge in that medium.

The bleaching and clarification process commonly used these days is the blowing of air through the oil. In addition to the chemical action of the air oxidising part of the colouring matter, there is the important physical action of the interfacial tension produced at the surface of each air-bubble tending to attract and coagulate the colloidal impurities. It is possible that much better effect may be produced by blowing air through a device which breaks it up into innumerable minute divisions.

Artificial Butter and Margarine.

The enormous industry of the manufacture of margarine and artificial butter is essentially dependent upon the conditions leading to the formation of a stable emulsion of oil or fat, and water. Evidently there can be two sets of emulsion with these, water-in-oil and oil-in-water types. In the first, water forms the disperse phase, while in the second it is the continuous phase. It is now generally recognised that for the formation of a stable emulsion the presence of a third phase, called the emulsifier, is necessary. The conditions, therefore, for the formation of a stable emulsion are that the drops should be so small as to remain suspended in the continuous medium, and be coated with a viscous film preventing them from coalescing with one another. A satisfactory emulsifying agent is therefore a substance which readily goes into the interface and produces a good film. With regard to the action of the emulsifier in producing an emulsion of the one or other type, it has been found that if the emulsifier is water soluble and lowers the surface-tension of water, it

would form an oil-in-water type of emulsion, whilst if it be oil-soluble, the other type would be formed. Experiment has shown that the o/w type of emulsion is easier to make and keep than the w/o type, so that though butter churned out of milk is an emulsion of the latter kind, artificial substitutes mostly belong to the former. In margarine manufacture, therefore, all the conditions are such as would favour an o/w emulsion. Since milk is an emulsion of this type it is one of the best emulsifiers. Similarly, such water soluble colloids as gums, starch, egg-yolk, and the like, added to milk, have a very beneficial effect. Had it not been for the unpalatable nature of the substances, alkali oleates being water soluble, colloids would have acted as excellent emulsifiers. From the mechanical point it is easy to see why the milk in bulk is continuously agitated, and the oil is fed in slowly, in preference to having the oil in bulk with the milk fed in.

The various pharmaceutical preparations of the nature of salves and medicinal oils are to the colloid chemist special preparations of emulsions of oil and water with various kinds of emulsifiers.

Lubricating Oils.

The problems arising in the manufacture of lubricating oils on a scientific basis, appear to be of two kinds, namely, the blending of vegetable with mineral oils, and the investigation of the suitability of an oil for lubricating a given bearing under given conditions of working. The blending of oils is a comparatively simple affair, since almost all vegetable oils are fairly soluble in mineral oils. One notable exception is castor oil, but as this oil by itself is an excellent lubricant its incorporation with a mineral oil is much sought after by the manufacturer. It seems more reasonable to make an attempt to form a homogeneous emulsion of the two by the addition of an emulsifier rather than to bring about a true solution of the two by subjecting the oil to chemical changes.

The other problem is a very complicated one and little work in the proper direction has been done. It is generally recognised that lubrication is due to the spreading of a thin film of the oil between the bearings, so that the metals no longer touch each other and produce friction during revolution. Now the work of Langmuir and others has shown that different gases, including air, are very tenaciously adsorbed by polished metal surfaces. Again, metals have got selective adsorption for liquids, so that an ideal lubricant for a particular metal bearing would be an oil which would displace the adsorbed layer of gas from the surface of the metal and itself form a stable film sufficiently thick to keep the metals of the bearing separate, provided the other conditions about flashpoint, gumming, and the like are satisfied.

B.—Industries Based on a Chemical Change of Glycerides

Chief amongst this group of industries is the hardening of oils by the hydrogenation process of Sabatier and Senderens. The activity of the catalyst has been found to be proportional to the fineness of the particles and the surface it offers for the reaction. The researches of Langmuir on the adsorption of gases by solid surfaces made it evident that the mechanism of the process is the adsorption of the oil vapour or oil and hydrogen on the surface of the metal catalyst. This has been experimentally verified by Armstrong and Hilditch and it is now the common practice to precipitate the metal within the pores of an inert substance like kieselguhr.

Boiled Oil, Paint and Varnish.

" Boiled oils " are prepared from drying oils, chiefly linseed oil, by heating them for a few hours at temperatures between 150°—250° C. and incorporating in them a small quantity—about 2 per cent.—of a metallic oxide or salt to quicken their drying properties. The colloidal phenomena connected with the paint industry have been ably summarised by Morrell in the Third Report on Colloid Chemistry, issued by the British Association for the Advancement of Science. We shall here touch on one or two points in which the applications of colloid chemistry would help us in understanding or improving upon the existing practice of carrying on certain operations in this industry.

The storing or " tanking " of linseed oil is an operation which is still very largely resorted to for the purification of the oil, but it involves the locking up of a large amount of capital. The same purification may be carried out by the electrolytic precipitation of colloidal mucilaginous matter. Recently Marx and Rozies have clarified various kinds of oils by combining in an apparatus called an electrocentrifugal separator, the operations of centrifugation and electrolytic precipitation. By subjecting the oil for about five minutes to a current of 40,000 volts and centrifuging at the same time at 2,700 revolutions per minute, an optically clear liquid is obtained at the end of that period.

The incorporation of a pigment in an oil leads more or less to the colloidal state of the former. The value of a paint depends upon the opacity or the covering power of the pigment, which for a given difference in the refractive indices of the pigment and the vehicle increases with the fineness of the former. Hence the more nearly we can approach the conditions for the precipitation of the pigment in the colloidal state during its manufacture, the better paint it would subsequently give. The ideal paint would be that in which the pigment is precipitated in the colloidal state in the vehicle itself. In ready-mixed paints a strong emulsion is formed by the addition of an emulsifier when the pigment goes into the interface and is kept from settling down at the bottom. Since the aim is to form the water as the disperse phase, the emulsifier should be oil-soluble, and hence calcium or magnesium oleates or rosinates are used.

An interesting case of the application of adsorption phenomena is seen in the use of fillers in the manufacture of mixed paints. It has been found that the inert filler should be considerably coarser in structure than the pigment, so as to get a good colour effect—a case of the adsorption of a finely-divided solid by a more coarsely powdered one. This explains why manufacturers prefer artificial calcium sulphate to the natural product, for the former has a long-fibred crystalline structure.

Hugoulin's process for making mixed paints is an example of the application of the principle of preferential adsorption of a liquid by a solid. In this process the pigment is first made into a paste with water, and then the oil is added with thorough stirring when the water is thrown out and the oil gets incorporated with the pigment. Since no systematic study of the phenomenon has been made, it is not possible to say, without performing actual experiments, whether a given pigment would give a paint by this process. But it is likely that those pigments that do not exchange their water with linseed oil may do so with some other drying oil.

C.—Industries Based on *Saponification*

The most important industry under this head is the manufacture of soap, in which empirical methods have led to a high degree of development in the art. Still, the recent classical researches of Professor McBain have thrown a flood of light on this important art and in not a few cases theory has prompted distinct improvements in practice.

The greater part of soap is still manufactured by the direct hydrolysis of oils and fats with a caustic alkali, and it is obvious that for the completion of the reaction the reagents must be brought into intimate contact—in other words, a thorough emulsion is to be formed. It has already been pointed out that soap is an excellent emulsifier for oil and water, and hence an addition of soap shavings to the charge considerably helps in starting the saponification. The use of a strong solution of an alkali at the beginning is avoided since soap is almost insoluble in strong alkali and the emulsification is not brought about. Again, the practice of adding the alkali in small quantities at a time obviates the danger of the " graining out " of the soap formed.

After the preliminary saponification or " pasting " operation, comes the salting out or separation of the soap from the lye. This is usually done by the addition of salt. In practice it has been found that soaps from different oils and fats require different quantities of salt for graining out. Since the colloidal nature of the sodium salt of the fatty acids becomes more and more pronounced with the higher fatty acids, it is clear that soaps from those oils which are rich in the lower fatty acids, like cocoanut or palm kernal oil, would be more difficult to salt out than those from tallow.

In the manufacture of transparent soap the aim is to produce a jelly and retard crystallisation of the soap. Since the presence of even small amounts of salt is antagonistic to the formation of jelly, saline impurities are removed by dissolving the soap in alcohol in which salts are generally insoluble. It has been experimentally shown that glycerine

or cane sugar retards precipitation and helps peptization to a very marked degree, and hence the use of these in preparing transparent soaps is now intelligible. In this connection it may be worth while to note that castor oil gives transparent soaps without the help of glycerine or cane sugar, and it is the only common oil which contains a hydroxy fatty acid. It therefore seems likely that the phenomenon of peptization is intimately connected with some peculiar action of hydroxy organic compounds.

Emulsions and the Oil Industry.

The problem of the making or breaking of emulsions comes up at almost every step in almost all the branches of the oil industry. We have already dealt briefly with the theory of emulsions, and only a few words are added here. There are two factors of importance in the formation of emulsions, namely, the low interfacial tension, and the electrical charge acquired by the disperse particles. Hence there is an optimum concentration of the emulsifying agent, in that there is usually a balance between the reduction of interfacial tensions which promotes, and the electrolytic effect which counteracts, dispersion. Amongst other considerations relating to emulsion, mention may be made of factors such as the size of the disperse phase, the viscosity of the respective components and the relative density between the two phases.

The importance of emulsions in the oil industry cannot be over-estimated. The preparation of margarine and allied artificial butters is a question of the stabilization of emulsions. The enormous industry of fat splitting, be it by the lime process, sulphuric acid process, or enzymic process is based on the successful formation of an emulsion. After saponification, the proper breaking up of the emulsion is of great importance, as without this it is impossible to utilize the products formed. A number of otherwise excellent examples of fat splitting by the lipase enzyme have to be given up from the commercial point of view on account of considerable losses due to obstinate emulsions. It is an unfortunate fact that emulsions are liable to form in the most awkward and least expected processes and the peculiarities of circumstances sometimes preclude the application of some of the ordinary emulsion breaking reagents. In such cases, a knowledge of colloid chemistry is expected to give material assistance in overcoming the difficulty.

Dyestuffs Exports in 1923

THE rise in the export of British synthetic and other dyes throughout the eleven months of last year has been maintained during December, when the total sent abroad was 19,486 cwts., as against 7,366 in 1922. The total for the year was almost double that for 1922, as is shown by the following month to month table :—

	1922. cwt.	1923. cwt.
January	9,494	10,468
February	6,916	8,610
March	7,222	12,149
April	8,485	13,083
May	7,358	16,599
June	7,761	13,864
July	7,763	19,323
August	6,965	18,095
September	9,506	21,333
October	9,936	21,043
November	12,485	21,436
December	7,366	19,486
Total	100,357	195,489

Sheffield Metallurgical Chemists

AT the annual general meeting of the Sheffield Association of Metallurgists and Metallurgical Chemists, Dr. F. Rogers was elected president, Messrs. J. Evans, G. R. Bolsover, T. G. Elliot, T. P. Colclough, vice-presidents, Mr. L. Dufty, hon. treasurer, Mr. G. B. Willey, hon. librarian, Mr. N. J. Evans, hon. secretary, and Dr. T. Baker, Messrs. J. H. S. Dickinson, J. H. G. Monypenny, F. M. Parkin, H. Rollin, C. E. C. Clark, B. H. Deby, P. B. Henshaw, E. Rowntree, and Dr. T. Swinden were elected members of the Council.

The President (Dr. Rogers), in his address, said that increased technical efficiency did not lead to a reduction of employment, but to its gradual displacement into other industries—for example, into those concerned with the production of new plants. Labour must realise the necessity of these changes, just as manufacturers had to seek new outlets and new manufactures. The technical man to-day was faced with intricate problems in the organisation of labour of widely different degrees of skill, in the constant tussle between man and plant, quality and economy. In such departments as the laboratory drawing office and tool room, there was in the nature of things much work of a non-repetitive character. The technical man must exercise his mass-productive faculty and keep his eye simultaneously on production, perfection, precision and price.

The Forced Draught Furnace

New Development of the "Turbine" Design

AN interesting new development in the design of the "Turbine" forced draught steam jet furnace for steam boiler and other general furnace work serves (a correspondent writes) to remind us that the science of furnace construction for these conditions is a much more complicated matter than is generally imagined.

The "Turbine" furnace (The Turbine Furnace Co., Ltd., 238B, Grays Inn Road, London, W.C.2) consists essentially, in the case of a Lancashire boiler for example, of four or five longitudinal trough firebars of any desired length, each provided with a steam jet to supply an air steam blast. In these trough firebars are situated small interlocking transverse firebars or elements which in the ordinary design hitherto adopted had between each pair one $\frac{1}{8}$ in. air slit. These have now been superseded, as the standard pattern, by a new "slot" element having nine tiny air slots, so that a 6 ft. grate, for example, contains about 50 of these elements in each of the troughs and over 2,000 air slots for the whole grate surface. This was originally designed for the purpose of burning extremely difficult refuse fuels in a fine state of division, such as anthracite "culm" or "duff," so that the full air blast could be used without blowing the material off the bars or allowing it to fall between unburnt. So successful has this type proved that it has now been adopted as the standard pattern for all fuels except those with a high volatile content.

The general advantages of a furnace of this description include high efficiency with consequently a reduced coal bill, because of the intense local heat, the ability to burn cheap inferior fuels, including general factory refuse; the granular nature of the ash with easy cleaning out; many years' life of the firebars because of the cooling and protective influence of the steam; simplicity of design and working; ease of installation without drilling the boiler plates; and low capital costs. A particularly valuable point also for the chemical industries is that the forced air blast is under easy control, so that fluctuations in the demand for steam can be met without difficulty.

The importance of scientific principles of design is best seen, however, in connection with the disadvantages of the ordinary type of steam jet furnace, which includes excessive steam consumption of the nozzles, wet flue gases, unequal intensity of the air blast at different parts of the furnace, both longitudinally and transversely and backdraught on opening the furnace door. Thus, for example, if the right design of nozzle—furnace throat, shape of trough, and, above all, the arrangement for diverting the air steam blast up between the elements—is not adopted, the first 12 in. of the grate length is often working with an actual suction downwards into the trough, the next 12 in. is neutral, and most of the blast is concentrated on the last 3 ft. This gives hollow fires at the back, loss of efficiency, backdraught, and wet flue gases, with excessive steam consumption to try and cope with the conditions. As seen by an elaborate series of tests carried out by the staff of a large steel works these troubles do not, however, happen with the "Turbine" furnace.

The steam consumption of the nozzles was found to be only 3 per cent. of the production of the boiler, more than repaid by the extra life of the bars alone, whilst the air blast pressure was found to be equal at every point of the grate, both transversely and longitudinally, the curves being practically a dead straight line. The reason is that a thorough study has been made by the Turbine Furnace Co., Ltd., of the science of the steam jet furnace, a fact that should appeal particularly to the chemical industries.

British Chemical Overseas Trade in 1923

Increase Shown in Both Imports and Exports

The Board of Trade Returns for December contain not only the usual monthly statistics of overseas trade, but also give figures showing the total trade of the past twelve months. The salient features of the chemical trade in both the monthly and annual return are reviewed below.

THE general trade of the country has shown a considerable increase during the year, the total value of the imports being £1,098,016,000, compared with £1,003,099,000 in 1922; exports being £767,329,000, against £719,507,000 in 1922; and re-exports £118,573,000, against £103,695,000 in 1922.

It is satisfactory, therefore, to note that under the heading "Chemicals, dyes, drugs and colours," in the official returns, imports in 1923 were £2,084,000 above 1922 (£13,462,000, against £11,378,000). The exports in 1923 were valued at £25,691,000, which represents an increase of £5,421,000 on the total for 1922.

The principal substances showing an increase in the quantities imported were the following:—

		1923	1922
Acid, acetic	tons	7,106	4,900
Borax	cwt.	63,887	44,566
Red lead or orange lead	,,	39,852	31,484
Nickel oxide	,,	45,701	3,407
Sodium nitrate	,,	1,452,578	917,368
Cream of tartar	,,	40,074	28,240
Barytes	,,	711,987	586,563

The imports of intermediate coal tar products used in dye manufacture increased from a total of 41 cwt. in 1922 to 1,349 cwt. in 1923. The figure for 1921, however, was 4,465 cwt. Crude glycerin diminished from 43,821 cwt. in 1922 to 24,672 cwt. in 1923, but otherwise the increases and decreases in imports have been but slight.

Good Exports of Chemicals

Turning to the exports, the outstanding increases shown during the year have been by sulphate of ammonia, coal tar products such as benzol and naphtha, and synthetic dyes. 253,287 tons of sulphate of ammonia were exported during the year, compared with 144,317 tons in 1922. Of this total, the largest portion went to Spain and the Canaries, which received 65,192 tons; France, which took the largest quantity (40,031 tons) in 1922, received only 27,617 tons. Japan took 60,117 tons, being the second largest customer in 1923, though in 1922 they had only 1,255. Next came the Dutch East Indies with 36,628 (28,112 in 1922), and then France, as mentioned above. Italy received 5,208 tons, compared with 2,589 in 1922, and the British West Indies and British Guiana 10,267, compared with 6,813 tons.

Of the coal tar products, 6,141 cwt. of anthracene were exported (115 in 1922); 2,303,864 gallons of benzol and toluol (64,679 in 1922); 317,393 gallons of naphtha (47,591 in 1922); 199,404 cwt. of naphthalene (against 42,062); and 47,780,495 gallons of tar oil, creosote, etc. (against 25,647,144) left the country. There was a slight decrease in carbolic acid from 140,337 cwt. to 133,558, otherwise all items in this class were exported in increased quantity.

The Export of Dyestuffs

Coal tar dyes, which have formed one of the features in the export trade of the year, totalled 126,187 cwt., valued at £1,031,903, compared with £47,317 cwt. in 1922, valued at £612,966. It may be noted that these figures show a decrease in the average cost of these dyes during the years under consideration amounting to about 37 per cent.

Sulphuric acid has remained almost unchanged with an export of close on 26,200 cwt. during each of the past two years, a figure much below that of 1921 however (53,742 cwt.). Increases are also shown in the quantities of the following chemicals, the 1922 figures being given in brackets:—Bleaching powder, 256,049 cwt. (235,431); copper sulphate, 42,091 cwt. (41,763); glycerin, 160,257 cwt. (81,420); potassium compounds, 81,299 cwt. (66,779); sodium compounds, 9,679,726 cwt. (8,496,085); and barytes, 76,039 cwt. (65,058). Caustic soda exports were 1,559,402 cwt., against 1,543,273 cwt.; sodium carbonate, etc., 5,970,275 cwt., compared with 4,964,299 cwt. in 1922; and sodium sulphate 1,514,619 cwt., compared with 1,395,788 cwt.

A decrease in exported quantities was shown in the following items (1922 figures being given in brackets):—ammonium chloride, 4,276 cwt. (5,851); zinc oxide, 2,871 tons (2,816); and white lead, 193,376 cwt. (197,433). In no case, it will be noted, was the decrease more than fractional.

Increased Trade in December

The Board of Trade returns for December show that the total imports of chemicals, dyes, drugs and colours for the month of December were valued at £1,079,370, an increase of £79,827 on December, 1922, and a decrease of £58,912 on November last. The value of exports under the same heading was £1,993,357, an increase of £173,642 on December, 1922, and also a decrease on November last amounting to £21,384.

Imports for December

		1923	1922
INCREASES.			
Acid, acetic	tons	369	303
Glycerin, crude	cwt.	7,245	562
Glycerin, distilled	,,	350	215
Nickel oxide	,,	3,418	3,407
Unspecified potassium compounds	,,	610,772	308,073
Intermediate coal tar products (including aniline oil, and salt, and phenyl glycerine)	,,	14	1
Natural indigo	,,	47	17
Painters' colours, not otherwise specified	,,	46,106	41,840
Essential oils, except turpentine	lb.	347,472	275,034
Turpentine	cwt.	31,919	13,826
Mercury	lb.	221,732	203,248
DECREASES.			
Acid, tartaric, including tartrates	cwt.	1,579	2,256
Bleaching materials	,,	3,158	3,830
Borax	,,	4,320	5,477
Calcium carbide	,,	61,573	62,633
Red lead and orange lead	,,	3,437	5,241
Potassium nitrate	,,	13,312	3,802
Sodium nitrate	,,	62,130	72,040
Other sodium compounds	,,	10,851	26,798
Cream of tartar	,,	3,419	3,833
Zinc oxide	tons	392	610
Alizarine dyestuffs	cwt.	298	1,908
Indigo, synthetic	,,	—	5,107
Unspecified coal tar dyestuffs	,,	1,502	3,475
Barytes, including blanc fixe	,,	42,963	52,538
White lead	,,	9,613	12,165

Exports for December

		1923	1922
INCREASES			
Acid, sulphuric	cwt.	5,532	758
Ammonium chloride	,,	554	412
Ammonium sulphate	tons	22,689	17,954
Anthracene	cwt.	220	—
Benzol and toluol	gals.	527,894	1,977
Naphtha	,,	85,719	2,239
Naphthalene	cwt.	10,189	7,190
Tar oil, creosote, etc.	gals.	3,527,015	380,089
Unspecified coal tar products	cwt.	30,104	24,972
Copper sulphate	,,	2,176	859
Crude glycerin	cwt.	3,993	1,473
Distilled glycerin	,,	6,921	12,922
Potassium chromate and bichromate	,,	3,646	3,248
Unspecified potassium compounds	,,	4,212	1,925
Sodium carbonate, etc.	,,	591,549	467,168
Caustic soda	,,	126,557	123,055
Sodium sulphate, including saltcake	,,	178,831	133,703
Unspecified sodium compounds	,,	47,820	42,835
Zinc oxide	tons	247	150
Coal tar dyestuffs	cwt.	12,934	3,603
Unspecified dyestuffs	,,	6,552	3,763
Barytes, including blanc fixe	,,	6,376	1,463
White lead	,,	21,670	13,858
Painters' colours, ground in oil or water	,,	28,608	25,924
Printers' colours, prepared	,,	29,649	19,901
DECREASES.			
Acid, tartaric	cwt.	1,786	2,522
Acid, carbolic	,,	6,131	7,500
Potassium nitrate, British prepared	,,	1,542	2,061
Sodium chromate and bichromate	,,	4,285	4,571
Painters' colours, etc., unspecified	,,	37,369	39,529

Position of British Dyestuffs in Export Markets

A Review of Ten Years' Progress

In the following review, specially prepared for THE CHEMICAL AGE, *a comparison is made of the pre-war and present position of British dyestuffs in export markets, and convincing evidence furnished of the remarkable growth of British trade overseas, in addition to the supply of home demands for which this country was formerly dependent on foreign sources.*

RUSSIA wants British dyes, says Sir Alfred Yeo—and what an interesting commentary this is, expressing in a few words the pre-eminent position in world production of dyestuffs which this country has attained since the war.

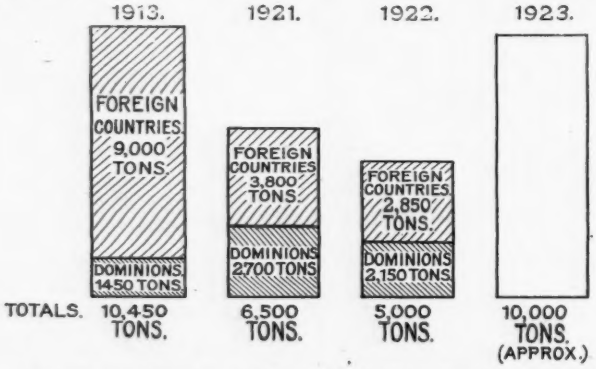
With the moral objections, put forward from time to time, against trade with Russia we are not concerned, since there can be no doubt that one economic result of according full recognition to Russia would be an immediate benefit to British dyestuff exports. The Russian dyestuff trade in 1913 totalled 3,000 tons, supplied by—

In 1922 Russia took nothing from us, and a market capable of absorbing 3,000 tons, with an even greater potential capacity, stands idle. A double incentive is thus offered to British exporters—viz., to regain a lost British market and, whilst political instability continues in Germany, to seize the opportunity of stepping into the shoes of the former German suppliers.

This is one instance illustrating the new complexion which has crept over the industry since the war, and in view of the growing British production, it is important to see the extent to which we are participating in the redistribution of world exports.

European Markets

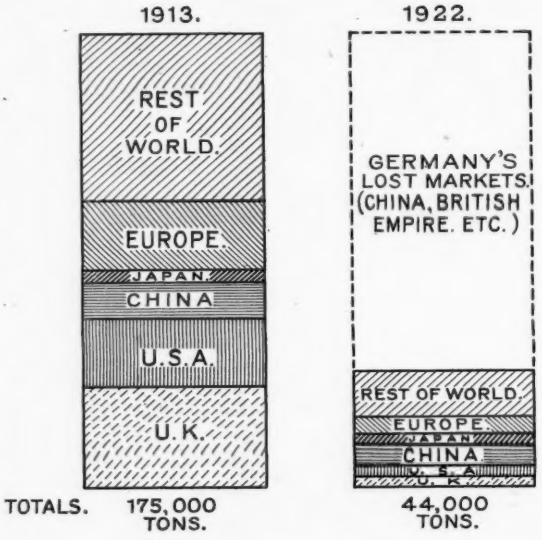
The economic disorganisation caused by the war has lowered the European consumption of dyestuffs, and until internal stability has been effected in Continental countries, it will be futile to expect any rapid and sustained expansion of British dyestuffs in that direction. Moreover, this factor has depressed our post-war statistics of exports, as compared with the previous figures, so that the remarkable increase in our dyestuff exports during the past year indicates the success attending the enterprise of British dye-suppliers in other markets.



Another predominant force in retarding the development of the dyestuff exports is the satisfaction of large home demands, which were formerly met by Germany. The *Statistisches Jahrbuch* for 1913 reports an import by this country from Germany of some 40,000 tons of dyestuffs and colours, whilst the figures for the corresponding items in 1922 is less than 4,000 tons. This position is explained by Dr. A. T. de Mouilpied's recent statement, that whereas we used to import 90 per cent. of our requirements we now produce 80 per cent. of them ourselves.

A glance at the 1913 diagram above is sufficient to dispel a popular misconception that this country has only entered the export trade in dyestuffs of late years. Of course, in pre-war days, Germany was the supplier of world importance, but the United States and Switzerland were also exporters, and all of these countries are competing to-day. German dyestuff exports have, however, suffered a serious decline, and it is in the lost markets that an opportunity for our own trade lies.

An analysis of the kinds of dyestuffs exported by Germany reveals a falling off between these periods of aniline dyestuffs from 60,000 tons to 14,000 tons, of alizarine from 12,000 tons to 1,570 tons, and of indigo from 25,000 tons to 6,000 tons.



The interesting inquiry on which to focus attention is, therefore, the extent to which British dyestuffs have entered these available markets.

The latest official returns of our export destinations for the year 1922, together with statistics for 1921, indicate the firm hold we are gaining in the Dominions and also in the Far East.

Chinese Market

This latter direction is reflected by the direct export, for the first time in 1921, of 15 tons to Java; but the predominant fact is our entry into the Chinese market, to which we exported nothing before the war, but which we supplied with 920 tons during 1921. Particularly is this satisfactory since more than 90 per cent. of the export consisted of indigo, for which China was the best customer of Germany in 1913, taking as much as 12,000 tons.

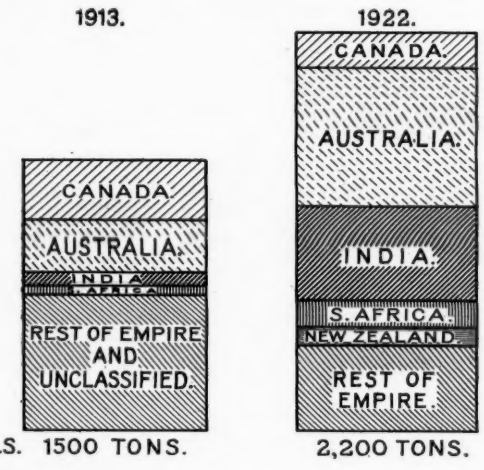
We have therefore gained a customer whose present capacity is great, but whose potentialities are enormous.

Empire Trade

It is in the Dominion markets, however, that British dyestuffs are making most headway, and from the point of view of Empire trade this aspect of our enterprise is very welcome. Before the war Germany held a leading position in Dominion supplies, and particularly in Australia, where imports from the United Kingdom were about half of those received from Germany.

In 1913 our export of dyestuffs to the Dominions was only 1,450 tons, as compared with 9,000 tons sent elsewhere, and the contrast afforded by post-war returns emphasises the fact that both absolutely and relatively our Empire exports have increased.

This branch of our trade has therefore grown immensely since the war, and the important place which British dyestuffs are gaining in these markets, which offer great potential expansion, is brought out very strikingly by the increased percentage of our dye exports which are now retained within the Empire.



Of our total exports in 1913 *only* 14 *per cent.* was taken by the Dominion, but in 1922 *over* 40 *per cent.* of our export trade in dyestuffs went to these markets. Moreover, the increase has been sustained in all classes of dyes and with all the Dominion countries. The countries which show greatest increases are India, Australia, and South Africa, and it is interesting to note how British dyestuffs have entered these in place of former German supplies.

The South African market is exceptional, as before the war *we* were the leading exporters in spite of competition from the United States and Germany, and this position has been maintained, but with greatly increased supplies from the United Kingdom.

India shows remarkable development in dyestuffs. In 1913 we supplied 60 tons, but the 1922 figure is over 500 tons, after touching 1,400 tons during the year 1921.

The Australian position merits inquiry, because she now takes treble the weight of dyestuffs from this country as compared with 1913, and because Swiss competition has now to some extent filled the rôle vacated by Germany. Textile developments have promised rapid expansion for dyestuffs, and as our best Dominion customer in 1922, the outlook for British dyes is favourable.

The rivalry from Swiss dyes which we are encountering, here and elsewhere, has prompted the suggestion that these are really of German origin, but reference to the Swiss *Statistik des Warenverkehrs* for 1922 disposes any transit trade in dyestuffs through Switzerland, as of the 10,980 tons received into that country practically all were retained. This must not, however, be taken to support any assumption that the German side of the industry is defunct, for though it has declined and may suffer still more with the signing of the Rhenish-Westphalian agreement, which permits requisition of dyestuffs on reparations account, nevertheless, the output of eleven dye-plants in that country, during October last, totalled 6,000 tons. Any suggestion therefore that supplies from that source have ceased, other than temporarily, is entirely misleading, but until the full force of this competition is again launched British dyestuffs have an opportunity still further to tighten their hold on world markets.

E. C. W.

Dynamite Explosion at an Iron Works

AN explosion occurred on Friday, January 11, in a section of the Partington Steel and Iron Works, Irlam. The explosion took place in a dynamite store and caused consternation among the inhabitants of the district, but although considerable damage to property was done, no personal injuries were received.

"Pulverised Fuel"

To the Editor of THE CHEMICAL AGE.

SIR,—With reference to my paper on "Pulverised Fuel and Efficient Steam Generation," I note that the statement continues to be industriously circulated that in this paper I have compared the regular running figures of Dalmarnock Station, Glasgow (mechanical stoking), with the short test figures only of the Lakeside Station, Milwaukee (pulverised coal). As this is the grossest possible mis-statement I should be grateful if you would allow me the use of your correspondence column to contradict it most emphatically, and to ask everyone interested to read the paper for himself.

The very fact that complete and continuous records for month after month, including, of course, all stand-by, banking, and blow down losses, have been taken with the Lopulco pulverised fuel plant at Lakeside, is the reason why the paper has been written, and the matter is explained very clearly in the paper itself, as for example, as follows :—Page 18, column 1, commencing line 22 from the top :—

> "As regards the figures obtained with pulverised fuel at Lakeside the net results are 85–86 per cent. actual working efficiency month in and month out. These figures are based in the first place on a most elaborate series of special tests carried out under actual running conditions, probably unsurpassed in the world for care and accuracy and for the time and trouble taken. Secondly, they are the results of continual weekly records taken as part of the routine of the station control. In May and June, 1923, the weekly figures averaged 86–87 per cent."

It is, of course, the figures for continuous running that matter, but I have also included the results of a number of day tests at Lakeside. On one occasion (page 18, column 2 of the paper) 89·1 per cent. efficiency was obtained, whilst on page 20 (table 8) I have given very elaborate figures for five tests varying from 19·92–42·33 hours' duration in which the efficiencies varied from 84·6–89·1 per cent. efficiency. During the last few days I learn 91·3 per cent. has been obtained on one test.

Accordingly, therefore, in the comparison I have assumed 86 per cent. for pulverised coal, the continuous figures, since in the more recent stations the guarantee figures alone are as high as 88 per cent.

As regards Dalmarnock, I give on page 16 the Dalmarnock figures for 52 consecutive weeks (1922–1923) showing 76·6 per cent. boiler plant efficiency, whilst as regards day's trials, I give on page 15 of the paper the results of a typical short test (one day, 21st, September 23) the efficiency figures being 78·4 per cent., and on page 17 the results of two very short snap tests of six hours and three hours, giving 81·92 per cent. and 83·56 per cent. efficiency respectively.

In order, however, to give every possible advantage to mechanical stoking, I have assumed Dalmarnock might be run at 81 per cent., although there is not a mechanical stoker station on earth that has ever run continuously at this figure. I would ask, as already stated, those interested therefore to read the paper themselves, and I can assure a number of people that the progress of pulverised fuel is not going to be delayed by misrepresentations of this character.—Yours, etc.,

DAVID BROWNLIE.

Arsenic in Food from Glass Containers

THE Society of Glass Technology held a monthly meeting on Wednesday at the Manchester College of Technology. The chairman was Professor W. E. S. Turner, of the Department of Glass Technology of the University of Sheffield, who read a paper in which he urged the desirability of glass manufacturers working to some sort of specification, so that the customer and user could have some assurance that the articles supplied would fulfil the conditions for which they were intended. Given a glass container of satisfactory general durability, he was convinced no foodstuff, whether packed moist or in syrup, or again in vinegar or fruit juices, was capable of extracting from glass any arsenic capable of detection by most refined measurement, even supposing it to be present in the very small amounts used in making some glasses.

Mustard Gas Production Claim

Cross-examination of Professor Green

THE hearing of the claim of Dr. H. Levinstein and Professor A. G. Green as to mustard gas was continued in the Law Courts on Monday before Mr. Justice Tomlin, presiding over the War Inventions Committee, and having with him on the Bench Mr. Chaston Chapman and Mr. Norton, K.C. The proceedings consisted of a prolonged cross-examination of Professor Green, the evidence of Mr. R. Curtis, and a statement of the case for the Crown by Mr. J. Hunter Gray, K.C. The court was attended by a number of chemists as witnesses and visitors, including, in addition to the claimants, Sir William Pope, Professor C. S. Gibson, Professor H. E. Armstrong and others.

Professor Green, in cross-examination by Mr. Gray, stated that in their process violent agitation of about 2,000 r.p.m. was early found to be an important factor in obtaining a satisfactory result. This was known by April 30, 1918, as a result of experiments carried out at the School of Technology, Manchester. The importance of the use of specially pure ethylene was also established by that date. He could not say whether any other of the five points of their process were then considered essential. These were enumerated by Mr. Gray as (1) the use of pure ethylene; (2) violent agitation; (3) low temperature; (4) regulation of the reagents; (5) leaving the sulphur in.

Professor Green's laboratory note books were produced. In answer to further questions he stated that though the results of the first batch of experiments, conducted in a closed glass vessel, had been negative, they had learnt not to try this method again. By May 2 the regulation of reagents was introduced by passing an excess of ethylene into sulphur chloride. This continuous process would be desirable on an industrial scale. The experiments were carried out in glass vessels because iron acted catalytically, it was thought, and rendered the action too violent. They were using a silver-plated steel agitator, but he believed the plating soon came off. With their continuous process, owing to the rapidity with which it was carried out, it had later been found perfectly practicable to work in iron vessels.

Mr. Gray stated that Professor Pope's process had dealt with the removal of the sulphur, and asked if it was obvious to any chemist that the sulphur should be kept in. Professor Green replied that it would be much simpler to leave it in.

Working at Low Temperature

In further cross-examination it was shown that lower mean temperatures were tried in succeeding experiments with the object of preventing the sulphur from being deposited. Professor Green said that by May 3 the principle of low temperature working had not been introduced, though that of keeping the sulphur in was established. Other conditions being all favourable the maximum temperature for keeping the sulphur in was 60°.

Mr. Gray: Did Professor Gibson arrive on April 20, with his note book?

Professor Green: He certainly arrived on April 20, but I did not see his note book.

Mr. Gray said that the Crown's contention was that Professor Pope was the inventor of the process, and he would call evidence to show that Professor Gibson, who was Sir William Pope's assistant, gave Professor Green and his staff assistance, and did not call to learn from the witness what he had done.

The witness smiled, whereupon Mr. Hunter Gray remarked: Don't smile, Professor Green. We may hear something, it may be.

Mr. Justice Tomlin: I think he may be entitled to smile. (Laughter.)

Mr. Hunter Gray: I am not finding fault at his smiling, but it is a little premature perhaps.

Witness said he thought counsel's suggestion was incredible.

Mr. Gray then asked if Professor Green's experiments were not a repetition of Professor Gibson's.

Professor Green: Of course not.

A diagram of Professor Gibson's apparatus was produced, and Professor Green stated that his differed essentially in having much more effective agitation and better means of purifying and drying the ethylene than the calcium chloride tube shown. On May 17, he said, Professor Pope had visited them and recommended high temperature and the separation of the sulphur. On May 22 Professor Pope was astonished to find that the sulphur did not come out, and that it was possible to work in iron vessels. Another point which struck him was the drying of the ethylene.

Monosulphide or Disulphide

Mr. Gray: Up to July 14 no analysis had been made of the product?

Professor Green replied that this was not necessary. The yield showed that the product was either disulphide, or monosulphide with sulphur in solution. Unless the sulphur was separated out it was not possible to show which the product was. Though some sulphur was obtained, its presence would not indicate the monosulphide unless it was an atomic proportion.

In re-examination by Sir Duncan Kerley, Professor Green said he was of the opinion that it was mainly disulphide, although at one time after an erroneous observation he had inclined to the view that it was monosulphide plus sulphur.

Mr. Justice Tomlin asked whether Professor Green had twice altered his opinion, to which he replied that he had reverted to his original view.

Professor Green, replying to Mr. Gray, stated that Dr. Levinstein had recommended the use of lead-lined vessels, but that these had proved unsatisfactory, and by June 14 the linings had been stripped and iron vessels used.

In a letter produced by Sir Duncan Kerley from Professor Green to Dr. Levinstein, the former had stated that the difference between their results and Professor Pope's was due to the agitation, the purity of the ethylene, and the low temperature. He suggested also that the precipitation of the sulphur was due to impurities in the ethylene, etc., in Professor Pope's experiments.

Production at Avonmouth

Mr. Raven Curtis, M.Sc., next gave evidence for the claimants. He stated that he was a chemist employed as a manager at the Avonmouth sulphuric acid factory from September, 1917. The first mustard gas plant was used there on June 15, 1918. The experiments were conducted at 55°–60°, and ethylene was bubbled in until no more was absorbed. It was intended to produce the monosulphide and sulphur. At 100° the sulphur was supposed to go into solution and be precipitated again in the cooler, the mustard gas being run off. The reaction vessel was a cylinder 5 ft. high by 3 ft., with no mechanical stirrer. By July 5 they had worked 8 batches. After partial success at first he described the results as very unsuccessful; the yield was low, the product impure, and the casualties high. They sometimes got only 10–20 per cent. of mustard gas, and the sulphur was never really got into solution. In July, 1918, Major Froissart visited them from France, with Major Lefebure, and stated that the French were getting good results at 40°, without separation of sulphur. Lower temperatures were immediately introduced, but without a maintained improvement. On July 6, Mr. Curtis said, the Levinstein process with the mechanical stirrer and the ethylene purifier was described to them. He then visited Blackley and saw the process in operation, and obtained full information about it. The old plant was closed down on July 16, and a plant with an agitator started. On August 22 an ethylene purifying plant was installed and after that time they made 450 tons before the Armistice, with occasional trouble from sulphur. Professor Gibson had seen this plant and thought the conditions were then right.

In cross-examination by Mr. Gray, Mr. Curtis said that they had decided to use an agitator and cooling coils experimentally about the end of June, before his visit to Blackley. The agitator ran at about 150 r.p.m. and this low speed was maintained when the Levinstein plant was introduced. He believed that they had trouble occasionally at Blackley from sulphur.

Sir Duncan Kerley, among other points, asked whether Mr. Curtis knew that Sir William Pope had advised that the ethylene need not be pure. Mr. Curtis replied in the negative.

Question of Remuneration

Mr. Justice Tomlin here asked whether Dr. Levinstein had not said that he did not wish any remuneration for the invention. Sir Duncan Kerley said that what Dr. Levinstein had said was that he did not want any unless the others were also paid. A

fee had been arranged, but as far as he was aware nothing had been paid.

This concluded the claimants' case.

The Case for the Crown

Mr. Hunter Gray, in briefly outlining the case for the Crown, said he would show that the French were making mustard gas and filling shells with it in April, 1918. Levinstein and Green were not the influence they claimed in the introduction of the low temperature process, but the French were. He would call evidence to show that Chance and Hunt, Castner-Kellner and others were obtaining mustard gas in March, in which the sulphur did not separate. Samples of this were sent to the Government in March, 1918. He would show also that the process at 55° 60° was giving satisfactory results.

Mr. Justice Tomlin interposed by saying that in that case one thing which would have to be shown was why, in July, 1918, Blackley, where the Levinstein process was operating, was the only place where mustard gas was being produced successfully.

The hearing was adjourned till Monday next, and it was intimated that the case would occupy about three more days.

Problems of Fractional Distillation

The Need of More Exact Scientific Data

A MEETING of the Manchester Section of the Society of Chemical Industry was held at the Textile Institute, Manchester, on Friday, January 11, Dr. E. Ardern presiding in the absence of Dr. Levinstein, who was attending a meeting of the Council in London. A Paper on "Fractional Distillation," by Messrs. C. Elliott, B.Sc., A.M.I.C.E., and A. Brittain, M.Sc., A.I.C., was read by the first-named author.

Scientific Study in Its Infancy

Mr. Elliott said that the subject of fractional distillation covered a very wide field, but it was rather surprising that more was not written on the subject when one considered its many applications in industry. On the technical scale the design of distillation plant had been, and still was, based almost entirely on practical experience and followed the use of empirical rules. The scientific study of the subject was still in its infancy as far as its co-ordination with the practical side was concerned, and there was no doubt that much would be gained if theory could supply more useful data.

The effect of altering the pressure under which a distillation was carried out on the composition of the distillate from miscible liquids which did not form constant boiling point mixtures had received but little attention. Usually, in practice, the external pressure was reduced in order to lower the boiling temperature of the liquids being distilled, and consequently to minimise the tendency to decompose or polymerise in the case of many liquids. The more difficult aspect, whether the liquid could be separated by fractional distillation more easily at pressures greater than atmospheric pressure, or under reduced pressure, was never or rarely taken into account. The reason for this lack of consideration was very obvious, for practically no scientific information was at the disposal of the refiner, although vacuum distillation was very widely employed in industry.

American Experiments

Using the excellent laboratory apparatus described by M. A. Rosanoff (*Trans. Amer. Chem. Soc.*, 1914) a series of distillations were carried out under atmospheric and reduced pressures, and the respective curves drawn establishing the relationship between the composition of the liquids and of the vapours in equilibrium with them. Thus, in the case of pyridine and the cresols, the effect of reducing the pressure from 750 mm. to 45 mm. showed very striking differences in the composition of the distillate, and pointed to a tendency, at least, towards the formation of constant boiling point mixtures or actual combinations.

The change in the composition of the distillate from binary mixtures due to change in pressure depended on the variation of the ratio of the vapour pressures of the substances in the free state and on the heat of dilution developed when they were mixed together. This change could be calculated accurately for certain ranges of temperature.

Viewed from the aspect of ease of separation by fractional distillation, and irrespective of the avoidance of decomposition, it was apparent that, in certain classes of liquids, it would be advantageous to work not at the lowest possible pressure, but at one particular pressure, or even by varying the pressure continuously throughout the distillation. In distilling *in vacuo* as compared with working at atmospheric pressure, one should remember that the latent heat of the substances, and therefore the steam required, was increased, the volume of the vapours was greater, and the water required in the dephlegmating and final condensers was increased because the temperature difference between it and the vapours was lower and the latent heat higher. The size of the bubbles on the trays would also be larger than under atmospheric pressure. Equilibrium between the bubbles and the liquor on the trays was never attained, except perhaps on the outside surfaces of the bubbles, unless severe distortion and breaking up of the bubbles occurred. One would expect, therefore, that the efficiency of separation obtained with a given column would be lower when working under reduced pressure than under atmospheric pressure if the same liquids were distilled.

Use of the Lead Cathode

A second paper on "The Use of the Lead Cathode in the Electrolytic Method for the Estimation of Minute Amounts of Arsenic," by T. Callan, M.Sc., Ph.D., was also read.

Dr. Callan stated that lead cathodes used in the electrolytic method for the detection of minute amounts of arsenic showed certain irregularities after being in use for some time, and these irregularities and their cause and elimination were dealt with. One of the chief causes of insensitivity of lead cathodes, that is, failure to give off the full amount of arsenic added to the electrolytic cell, in the form of arseniuretted hydrogen, was due to overworking the cathodes, when they apparently become coated with a layer of sulphate or oxysulphate of lead. Such inactive cathodes could be restored to their normal sensitivity by treatment for a few minutes with warm dilute nitric acid. If, however, lead cathodes were treated repeatedly with hot dilute nitric acid they became quite insensitive, although possessing a bright metallic surface. Lead cathodes thus rendered insensitive could be re-activated by the addition of a minute amount of cadmium sulphate to the electrolytic cell.

Death of Chemical Workers from Cancer

INQUESTS were held on Friday, January 11, in Manchester on two labourers who had been employed at the works of the British Dyestuffs Corporation, Blackley.

In the first case it was stated that John Thomas Horrocks (58), Spinners Road, Blackley, died at the Manchester Royal Infirmary, on January 4. On May 31, 1922, when working on the cleaning of drums, he reported sick. The works doctor, Dr. T. H. Wignall, reported that he was suffering from acute perspiratory toxemia, due to washing casks formerly used for nitro products. In August he returned to work, and from that date to September 8, 1923, he worked as a labourer in the general stores and not amongst chemicals. From September 10 to January 1, 1924, he worked as a fitter's labourer. On January 2 he did not return for duty, and was admitted to the Manchester Infirmary on January 3 as an urgent case.

Dr. Wignall, in reply to the Coroner, said he knew the man had died from cancer, but the poisoning from which he had suffered had no connection with the cause of his death. Dr. Bryce, who made a post-mortem examination, confirmed this opinion.

The Coroner returned a verdict of death from natural causes.

The second inquiry concerned Cornelius Kennedy (52), who died at Crumpsall Hospital on December 11. He had lived at Nail Street, Rochdale Road, and worked for the British Dyestuffs Corporation for nine years. Dr. Wignall said that Kennedy came to see him on March 30, 1922. He had a small sore on the lower part of the body, and was given a letter for Ancoats Hospital. Later, when witness saw him he had ulcerated masses, and Kennedy attributed the original burn to the adhesion of sodium sulphide while he was shovelling it. A sore of that description might undoubtedly result in cancer. Dr. A. F. Whyte, Crumpsall Hospital, said that the cause of death was hæmorrhage from an ulcer accelerated by the burn due to sodium sulphide, and by chemical absorption while employed by the British Dyestuffs Corporation.

The Coroner returned a verdict of accidental death.

Oil and Colour Chemists

Chromes from the Consumer's Point of View

THE January meeting of the Association was held at Birkbeck College, London, on Thursday, January 10, when Mr. P. R. Koekkoek read a paper on "Chromes from the Consumer's Point of View." Dr. J. Newton Friend (president) occupied the chair.

The object of the paper was to demonstrate that chromes can vary to an enormous extent, thereby enabling them to embrace all conditions that may arise. It was well known to all colour manufacturers, the author said, that two chromes of the same chemical composition and of the same shade could be produced by a variety of methods, and most colour consumers knew from experience that two or more chromes, apparently identical, behaved quite differently when used for any one special purpose. The explanation was that two chromes made by different processes, although of the same composition and of similar shade and strength, might vary in their other physical properties. He feared that, although these facts were well known to colour makers, they were not always borne in mind by them when supplying the wants of colour consumers. Therefore, he proceeded to illustrate to the consumer the variations possible in what was apparently the same thing, and to tell him how these variations were obtained, in order to help him to judge which class of chrome would be the ideal for his special purpose.

Composition

Under this heading, the author said that of those chromes designated as genuine, all shades between middle chrome and orange chrome consisted of mixtures of lead chromate and basic lead chromate. The palest middle could be lead chromate alone, and the deepest orange basic lead chromate alone. For primrose and lemon it was necessary for lead sulphate to be present, but any such lead sulphate must be simultaneously precipitated with the lead chromate, which caused lead chromate to remain paler in shade throughout the washing and drying, thereby producing lemon shades. A chrome which had had lead sulphate mechanically mixed in, over and above that chemically precipitated with the lead chromate, was no longer genuine, though he regretted that many chromes so prepared were described as genuine or pure. The presence of this mechanically mixed-in lead sulphate was readily detected by low strength when compared with the chrome of similar shade made entirely by precipitation. Pointing out that certain chromes sometimes contained other ingredients, he said that orange chrome could be produced by boiling lemon chrome with quick lime. If made in this way the finished orange chrome would contain a small percentage of calcium sulphate, but it should not be condemned on this account.

Modifications in Method of Manufacture

Prior to the production of a chrome, the lead was converted into a compound which would react with the compounds of chromium. This could be effected in a variety of ways, but finally the lead was converted into lead acetate or basic lead acetate, lead chloride or basic lead chloride, lead nitrate or white lead or lead sulphate. Chromes so produced were classed as acetate, chloride, nitrate, white lead and sulphate chromes respectively. According to the intermediate compound of lead worked from, a different variety of chrome was produced which, although of similar chemical composition, had different physical properties. The element chromium was converted into potash or soda salt, the finished chrome being modified according to whether soda or potash was used. Chromes could be produced in weak acid solutions or in neutral solutions, affecting considerably the crystalline structure and bulk. They were also modified in crystalline structure according to whether precipitated hot or cold, and to the degree of concentration of the solutions—hot precipitation and strong solutions producing more crystalline chromes, those produced cold and from weak solutions tending to be less crystalline. The formation of crystalline chrome was controlled for certain shades by the amount of agitation during and after production; the greater the agitation the less crystalline the chrome. It was necessary in some cases to control the number of revolutions per minute of the mechanical stirrers, because if the rate of stirring were altered the crystalline structure of the chrome would be modified, and its physical properties thereby altered. Rate of precipitation and speed of washing also needed to be controlled. Allowing a chrome to stand some hours prior to being washed caused a considerable darkening in shade owing to the formation of crystals, whilst allowing certain chromes to stand after washing but before filtering caused swelling up, producing light and bulky chromes of increased strength. Certain chemicals, in particular certain organic acids, also affected the physical structure, and modified the shade of the finished chrome.

Strength and Stability

Consumers continually demanded stronger chromes, and many devices were adopted to make them stronger. It must be remembered, however, that the stronger the chrome the more artificial was its condition, such extra strength only being obtained at the expense of stability. Producing chromes from neutral solutions and allowing them to stand some hours after washing was a means to this end, these chromes usually being of lower specific gravity. Boiling basic salts, then cooling before precipitation, also had the effect of producing a little extra strength. Chromes produced from lead sulphate and white lead were always weak, as a certain proportion of unaltered lead sulphate or white lead remained in the finished chrome. In this respect these chromes resembled those to which had been added, mechanically, lead sulphate or white lead.

Specific Gravity Bulk Oil Absorption

Chromes of the same chemical composition and shade could vary as much as or more than 100 per cent. in bulk, so that if a colour consumer required alteration in bulk the maker could usually effect the alteration. Paint and enamel makers should select chromes of the bulky type, as these held up better in oil and varnish media. Paper coaters, on the other hand, should use heavy chromes, as these retained less water and facilitated the process of paper coating. Bulky chromes generally had a higher oil absorption than dense chromes. Printing ink makers usually demanded high oil absorption, but if this bulk had been obtained by causing the chrome to swell in water, the result, when ground in varnish, was that the finished printing ink was possessed of no flow, and consequently printed badly. Those who used chrome for blending should select chromes with a gravity as near as possible to the other colours in the blend. More might be done in this respect when blending chromes with blue or producing greens to avoid the so-called floating of blue. Leather enamellers, who used very thin enamels, should watch this question of bulk particularly, as the thin mediums used facilitated the separation of colours of different gravity.

Shade and Undertone

Chromes could be produced of the same depth of chrome but of different tone. This difference was still more noticeable in the undertone. These differences were chiefly governed by the intermediate form of lead used, such as nitrate, chloride or acetate. The chloride was inclined to be a golden yellow, the nitrate was more reddish, and the acetate greenish. All varied in brightness, depending on the skill of the colour maker, purity of materials used, and the general cleanliness observed throughout. Chromes produced from hot solutions tended to be redder than the same chromes produced cold. Those made from concentrated solutions were also duller. The presence of certain organic acids and other chemicals in the precipitating vat had the effect of producing modified shades.

Crystalline Structure

When two or more chromes of the same chemical composition varied in bulk or shade or strength, it was due to the effect the method of production had upon the crystalline structure. Chrome differing in chemical composition, but similar in shade and strength, must differ in other physical properties. Therefore, because a certain chrome was unsuitable for a certain purpose, it did not follow that a chrome similar in shade which would answer could not be produced.

Giving the results of practical observations and a few of the conclusions arrived at, the author said the largely accepted idea that some chromes were amorphous and some crystalline

must be modified. Chromes were not amorphous or crystalline; all were crystalline, but it was a question as to how well the crystalline structure was developed and how it had been modified by the method of production. When it was considered that each intermediate form of lead used modified the structure of the crystals, and that each of these modifications was varied to a much greater degree by temperature or reaction, concentration of solution, violence of agitation and other factors, it could be seen that the physical properties of chrome, as affected by the crystalline form, could vary considerably. The different crystalline structure of chromes produced by nitrate, chloride and acetate methods altered the tone of the chrome to an extent which rendered the type easily recognisable by one versed in all three. The effect of concentrated solution and high temperature was to produce larger crystals of chrome than low temperature and dilute solution. Agitation prevented the growth of large crystals by mechanically breaking up any that were formed. Chromes precipitated in acidified dilute solutions came down as extremely fine crystals, packing closely together, producing chromes of high gravity. Those produced in neutral dilute solutions were also very fine crystals, but light and bulky, making the finished chrome of low specific gravity. If allowed to stand after precipitation, but before washing, the crystals were enabled to grow and develop, producing chromes of well-defined crystalline form. If allowed to stand after washing, some chromes would swell up, the crystals assuming a flocculent appearance, producing bulky chromes of a spongy nature. The finer the crystals the paler the chrome. The effect of the co-precipitation of lead sulphate and lead chromate was to produce fine crystals of lead chromate, thereby giving pale shades. The introduction of alumina was more marked, the chrome being precipitated in even a finer state, giving the well-known primrose shades. On the other hand, orange chromes must be decidedly crystalline, and, to get the best shades, must be produced in concentrated boiling hot solutions.

Selection of Chrome

The relative merits of chrome as produced by nitrate, acetate and chloride methods depended more on the tone required than on any special merits any one of them might possess, with the exception of one or two trades in which the author was partly convinced that one was more suitable than another, for special reasons. Though the author did not compare the merits of the respective hues of chromes made by these three methods, he pointed out that some chromes had to be dirtied with black in order to match certain shades, the consumer resisting all efforts to make him use cleaner and brighter chromes. Explaining why some chromes were suitable for a special process, whereas some were unsuitable, he suggested that this was determined by the crystalline structure, as affected by methods of manufacture other than the intermediate form of lead used. Most trades were best served by light and bulky chromes. They held up better in liquid media, had a higher oil absorption, and were usually possessed of great strength. In some cases, however, less bulky chromes were more suitable, such as the paper coating trade. It was the practice of paper coaters to stain their solutions of glues and gums with chrome in water pulp, and if these chromes were bulky and contained too much water they caused thinning of resulting mixtures. Therefore, chromes of high gravity and low water absorption should be selected—i.e., those produced from acid solutions. All colour makers did not take seriously enough the alleged whims and fancies of colour users. When a chrome was turned down as unsatisfactory, the matter merited closer investigation, and should not be put down to prejudice. On the other hand, colour users should, to a greater extent, consult colour makers in their difficulties, and benefit by the experience and knowledge of their staff of colour chemists.

A discussion followed, in which Mr. W. N. Borran, Mr. R. G. Browning, Dr. H. H. Morgan and Mr. Clark took part. The author, in replying, said the whole idea of the paper was that there should be co-operation between user and manufacturer. He had been a manufacturer himself, and was now a distributor, but he candidly confessed that whereas formerly he had looked upon most of the complaints of the user as due to prejudice or ignorance, he now felt that many of them were absolutely genuine and really based on scientific facts.

The World's Fertiliser Output

Comparison with Pre-War Statistics

THE International Institute of Agriculture, at Rome, has issued its year book for 1922,* an abstract of which appeared in the *Board of Trade Journal* for November 22 last. The report deals with the world's supply of phosphate, potash, and nitrogenous fertilisers during the year.

As regards the production of natural phosphates the mining operations appear to have recovered in 1922 from the effects of the war. North Africa (Tunis, Algeria, Egypt and Morocco) yielded in 1922 altogether 2,583,000 metric tons of phosphates, reaching almost the maximum production of 1913, which amounted to 2,736,000 metric tons. In the United States the production of phosphates in 1922 shows a diminution (2,457,000 tons, as against 3,161,000 tons in 1913); and the exports of this product show even a greater reduction (731,000 metric tons in 1922, as compared with 1,388,000 tons in 1913).

France, the largest producer of superphosphates, actually produced 2,133,000 metric tons in 1922, the highest figure yet attained. Germany also showed a yield much higher than in 1921, but still only one-third of the pre-war figure, Belgium actually exported the largest quantity, while Germany, formerly an exporter, became one of the principal importing countries. German production of basic slag, although increased, remained deficient, some 270,000 metric tons being imported. The production of basic slag in 1922 showed a very marked increase on 1921, in France, Luxemburg, and the United Kingdom. Luxemburg went beyond the pre-war yield, and France and the United Kingdom made great strides towards attaining it. In the aggregate, however, the world's output of basic slag was in 1922 much below that of 1913.

Progress in Potash

The potash industry, which in 1921 had already practically regained its pre-war position, continued in the following year to make progress. Germany, France and Poland yielded in 1922 altogether 1,512,000 metric tons of potashes, expressed in K_2O, as compared with 1,070,000 tons in 1921 and 1,168,000 tons in 1913. The German mines alone delivered, in 1922, about 380,000 metric tons more than in the preceding year, exceeding by about 200,000 metric tons the respective 1913 output, the greatest previously obtained, and which included Alsace. The German exports in 1922 did not reach their pre-war level; but, in compensation, home consumption increased considerably. France in 1922 had more than doubled her 1921 exports of potash fertilisers.

In nitrogenous fertilisers the increase in the demand for the synthetic products and the decline in the production for the natural nitrates was continued in 1922. The yield of nitrate of soda in Chile came to 1,068,000 metric tons, against 1,321,000 tons in 1921. Thus it is seen that in 1922 the production was lower than in 1909 onwards, and equal to much less than half the yield obtained in 1913. The exports of nitrate from Chile in 1922 were greater than those of 1921, but are still equal to much less than half the exports of the last pre-war year.

Synthetic Nitrate

The amount of nitrate of lime produced by Norway continued to increase in 1922, reaching a maximum of 156,000 metric tons, as compared with 130,000 tons in 1921, and 73,000 tons in 1913. As regards cyanide of calcium the French output, which was 13,707 metric tons in 1920-21, increased to 29,000 tons in 1921-22, and to 42,000 tons in 1922-23. Germany produced 238,000 metric tons in 1922, as against 250,000 tons in 1921, and 48,500 tons in 1913.

The German yield of sulphate of ammonia for 1922 was 1,191,000 tons, more than double that of 1913, and the U.S.A. output of 474,000 metric tons was higher than in any previous year, and a three-fold increase on the pre-war figure. The United States were able, therefore, to export about 150,000 metric tons of sulphate of ammonia in 1922, thus becoming the world's most important exporter, surpassing even the United Kingdom, who, heading the list in 1913 with exports of 328,000 metric tons, had in 1922 reduced the quantity sent abroad to 148,000 metric tons.

* *The International Year Book of Agricultural Statistics* 1922. Copies may be obtained from the Ministry of Agriculture, 10 Whitehall Place, London, S.W.1. Price 8s.

Protection for Indian Chemicals

Evidence of Chemical Manufacturers

THE Indian Tariff Board, which has been taking evidence at Bombay, heard recently evidence on behalf of the Dharamsi Morarji Chemical Co. and the Eastern Chemical Co. in favour of protective duties.

Mr. Pandit, representing the Dharamsi Morarji Chemical Co., in the course of a written statement, said: Now that the Government of India have adopted the policy of introducing measures for the development of Indian industries on the recommendation of the Fiscal Commission of 1921-1922, we invite the attention of the Board to be concentrated on the development of the chemical industry in India, which in our opinion is of great national importance. The measures we would suggest should take the following forms:—(1) Total abolition of import duty on sulphur; (2) Increase of import duty on such chemicals as are being manufactured in India at present.

The Present Position

The present import duty which is on the Tariff valuation of sulphur (Rs. 120) works out at something like 18 to 20 per cent. of the invoiced value of imported sulphur. Thus, although sulphur can be purchased at a c.i.f. price of Rs. 90 to Rs. 100 per ton, the manufacturers have to pay an import duty of Rs. 18 per ton and Rs. 5 per ton for landing and other charges. Sulphur therefore costs us anything from Rs. 115 to Rs. 123 per ton. This is against Rs. 65 per ton at which sulphur is obtainable in England. Under such conditions it is unlikely that the chemical industry, which is entirely dependent on the manufacture of sulphuric acid, can ever develop to any large extent.

Our first suggestion therefore is to allow sulphur to be imported duty free. We urge that economically the loss to the State by total abolition of import duty on sulphur would be negligible, since the revenue derived from the source is less than 2 lakhs a year; but the gain due to a rapid development of the industry would be considerable, as it would mean a substantial revenue to the Government by way of super and income-tax when the industry is allowed to prosper.

Steps should be taken for the development of the manufacture of chemicals in India. A large number of chemicals at the present moment possess the natural advantage necessary for their manufacture in India, inasmuch as the principal raw material which is sulphuric acid necessary for their manufacture is produced in this country on a fairly large scale. The present import duty of 15 per cent. on chemicals in our opinion affords little protection to chemicals which are being produced in India, and has proved inadequate as a safeguard against the dumping of chemicals by foreign manufacturers who make light of the present import duty.

Small Increase no Use

If, therefore, it is seriously intended to protect the indigenous chemical industry, a half-hearted increase in the present tariff would not achieve the desired result. We think that a protective tariff of 15 per cent. in addition to the existing import duty for say, 15 years, would be far better to set the industry on its feet, rather than a nominal increase at which the industry might struggle on, a burden to the Indian investor, and no asset to the Government.

Another direction in which we would press the claims of the Indian chemical industry is in the matter of railway freights, which are so high as to put the manufacturers completely out of the distant markets in India. The freights work out so heavy that they unnecessarily add to the costs of the raw material, much increasing the cost of production of the chemical.

In conclusion, the grounds on which we feel justified in asking for a sufficiently high percentage protection on heavy chemicals to successfully withstand the competition of foreign manufactures are as follows:—

(1) To render India completely independent of foreign sources of supply as regards acids and heavy chemicals, both in times of war and in peace times.

(2) To afford Indian students of chemistry opportunities for practical training in the manufacture of acids and chemicals so as to do away with the necessity for them to go abroad for this purpose.

(3) To check the continuous drain of money from India spent in the purchase of large quantities of acids and chemicals.

Eastern Chemical Co.'s Views

Mr. Siglas, representative of the Eastern Chemical Co., in the course of a written statement, said the greatest disability from which the chemical industry suffered was in the imposition of a 15 per cent. duty on imported sulphur, based on a tariff valuation of Rs. 120 per ton. In actual practice, however, this duty worked out to something like 25 per cent. on the c.i.f. cost and 22 per cent. on the cost of the article delivered at the works. The incidence of this duty, high as it was from the purely industrial point of view, was an unjust burden on their particular industry, since sulphur as a raw material was unknown in this country, the same having to be imported from the United States of America, Italy, and Japan, and because it formed the basis of at least three industries of vital importance to India, viz.: steel, manure, and chemicals.

The position of India as primarily an agricultural country demands that every effort should be made to improve its agricultural resources as much as possible. The development of the use of fertilisers might rightly be regarded as a matter of first national importance. An extended use of fertilisers in India could only be secured by the cheapening of costs, and this provided another very strong argument in favour of the abolition of the duty on sulphur, for it might be said of the greater part of India that the necessity for using fertilisers was imperative, and the supply notoriously inadequate to both actual and potential requirements.

In countries where artificial manures were employed one cwt. per acre was a very conservative estimate of fertiliser required. On this basis the acreage under cultivation in the Bombay Presidency could easily absorb one and a quarter million tons of fertilisers provided scientific methods were used. The loss of revenue occasioned by the abolition of the duty on raw materials would probably be counterbalanced by the increased revenue consequent upon the imposition of a protective tariff in the case of manufactured chemicals.

Both the witnesses, Messrs. Pandit and Siglas, gave oral evidence in amplification of what was contained in their written statements, and explained in detail how the removal of 15 per cent. duty on sulphur would affect the price of the various products made out of sulphur. They said that the defect of the present duty of 15 per cent. was that they paid the duty on the price, which was equivalent to a duty of 20 per cent. on the invoice value of sulphur. The invoice value of sulphur was about Rs. 90 per ton and the tariff valuation came to about Rs. 120 a ton.

64,000 Ton Contract for Middlesbrough Firm

WHAT is probably the largest iron foundry order placed with one firm at any one time within the memory of the present generation has been undertaken by Cochrane and Co., Ormesby Ironworks, Middlesbrough (not by a Westminster firm with a similar name, as stated last week). It consists of over 60,000 tons, being the whole of the cast iron tunnel plate segments for lining the City and South London Railway (Wimbledon Tube), which is part of the Government scheme for relieving unemployment, and also coping with the ever-growing necessity of improving London's transport facilities. The boring of the tube itself will be conducted from several points, and Cochrane and Co. will require to deliver at such a rate as will keep all the large number of men employed by the boring contractors fully engaged. This will necessitate delivery at the rate of about 1,500 tons per week over the whole of 1924. The segments will be loaded in steamers at Cochrane and Co.'s own wharves, and after arrival in London will be transported by motors to the various sites.

This, and other important orders secured by Cochrane and Co., will help materially to relieve the unemployment situation in Middlesbrough, as it will necessitate the constant employment of many hundreds of men, not only at Cochrane's foundries and blast furnaces, but at their collieries and coke ovens in Durham, and at their iron mines in Northamptonshire. In addition to this they have just secured the order for, approximately, 6½ miles of 24 in. cast iron pipes for the Tees Valley Water Board, Aqueduct No. 14. This involves over 4,000 tons, and will find employment over this year for a large number of workers in the district. These important contracts will necessitate the blowing in of another of the firm's blast furnaces in the course of the next few weeks.

United States Chemical Trade

Import and Export Figures for 1923

CHEMICAL exports have shown a healthy growth during the past year, while imports, though changing in character, have remained at pre-war levels, according to an analysis made public by the American Chemical Society. In 1913 imports exceeded exports by over $32,000,000. The largest increases in imports in 1923 over 1922 occurred in those products not produced to any extent in the United States, and, therefore, of a non-competitive character. These imports of non-competitive goods are offset largely by increases in the export of chemicals which the United States supplies. For example—pigments, paints and varnishes, medicinal and pharmaceutical preparations, especially proprietary medicines, fertiliser materials, such as ammonium sulphate and phosphate rock, and coal-tar dyes. In the case of dyes the increase is due to the interruption of the export of dyes from Germany when the French occupied the Ruhr.

The analysis, made by Mr. C. R. DeLong, of Washington, embraces the import and export trade of the United States in chemicals and allied products for the first nine months of 1923 compared with those of the corresponding period of 1922—the nine months preceding the passage of the Tariff Act of 1922—and with the pre-war year of 1913. "The import and export trade in chemicals and allied products," says the Society's statement, "for the first nine months of 1923 is practically balanced—exports exceeding imports by only $2,500,000, or by less than 3 per cent. Both the imports and exports of this group show a marked increase during 1923 over the corresponding period in 1922—about $22,000,000 in the case of imports, and about $16,500,000 in the case of exports. Although the excess of exports over imports decreased from $8,000,000 for 1922 to $2,500,000 for the corresponding period in 1923, it cannot be interpreted as indicating a return to the pre-war position in the naer future. In 1913 the import trade exceeded export shipments by over $32,000,000. On the contrary, it is evident that any increase in the importation of such products has been offset by decreases, so that the import of dutiable chemicals has been the same in 1922 and 1923. In contrast, the import of chemicals exempt from duty increased by nearly $22,000,000. If imports are found to have continued at the present rate during 1923, they will exceed those of 1913 in value by about 50 per cent., and exports in 1923 will be considerably more than twice the amount for the pre-war year 1913. However, if a correction is made according to the index of prices, imports in 1923 will be approximately equal to those for 1913, whereas exports will exceed the pre-war figure by about 60 per cent. Thus, while it is indicated that imports, although changing in character, have remained at pre-war levels, exports have shown a healthy growth.

Notes on Principal Products

The import of all coal-tar chemicals increased 50 per cent. in 1923 as compared with 1922. Although imports are slightly in excess of exports, the trade balance in coal-tar chemicals is much more favourable than before the war, when the United States not only had no export trade but depended almost entirely on imports.

Imports of acids and acid anhydrides more than doubled during 1923, while exports show a slight decrease for the same period, although they are still in excess of the pre-war exports. The increase in importation is almost wholly accounted for by that of white arsenic or arsenious acid to supply the increased demand for calcium arsenate in the cotton-growing districts for boll weevil control.

The imports of calcium compounds show a marked decrease in 1923, largely attributable to a decrease of more than $2,000,000 in the importation of citrate of lime. The imports of this product in 1922 were abnormally high in anticipation of an increase in duty.

Imports of potassium compounds other than fertiliser materials increased by 30 per cent. during 1923, as compared with 1922. On the other hand, exports, as might be expected, showed a decrease in 1923 as compared with 1922.

The importation of sodium compounds nearly doubled during 1923, while exports slightly declined from those of 1922. One of the marked increases in importations was in the case of sodium cyanide, which increased about $1,000,000 in 1923. The export of caustic soda declined about 25 per cent. in 1923, while exports of borax more than doubled in that year as compared with the preceding year.

Imports of paints, pigments and varnishes have been practically stable. Exports, however, increased 50 per cent in 1923 as compared with 1922, and are more than twice as great as pre-war. The largest increase was $2,000,000 in the case of carbon black, or an increase of 150 per cent. over the exports in 1922. The exports of ready-mixed paint showed an increase of 40 per cent., while varnishes increased by 50 per cent.

The increase in imports of fertilisers, particularly fertiliser materials, during 1923 was 60 per cent., as compared with 1922. The imports of potash fertilisers showed a slight decrease to about the pre-war level. The most conspicuous increase in imports of nitrogenous fertilisers was in the case of Chilean nitrate, which more than doubled. An increase of $18,000,000 in imports of sodium nitrate from Chile largely accounts for the large increase in imports of duty-free products.

The importation of vegetable oils increased 20 per cent. in 1923, and was more than three times the pre-war import.

Spontaneous Combustion of Coal

Birmingham Section of the Society of Chemical Industry

DISCUSSING the spontaneous combustion of coal at a meeting at Birmingham University of the Birmingham and Midland Section of the Society of Chemical Industry on Tuesday, Mr. J. Ivon Graham, assistant director of the Mining Research Laboratory, said that the loss through gassing and explosions resulting from spontaneous fires underground had been heavy, and the danger from this cause was likely to increase as years went on, owing to the necessity for deeper mining under conditions of higher temperature and greater pressure on the strata above and below the underground workings. The difficulty also arose at times in the storing of coal. Two main theories regarding the phenomenon had been held for years—one that iron disulphide or pyrites was the principal cause of the trouble, and the other that spontaneous combustion was the result of oxidation of the organic substances in the coal at ordinary temperatures.

It was now certain, declared Mr. Graham, that in some cases, both underground and on the surface, spontaneous heating resulted from the rapid oxidation of pyrites when this occurred in a finely divided condition. The greater proportion of trouble experienced in underground workings would appear to be due to the nature of the coal itself. Many coals had been found to absorb oxygen rapidly at ordinary temperatures when freshly ground, with the evolution of heat. If the latter was not dissipated—for example, as a result of the poor conductivity of coal or surrounding material—the temperature would rise. Increase in temperature caused an increased rate of absorption of oxygen, which, if not dissipated, would still further raise the temperature of the material, and so the process went on until the coal would eventually fire. The essential thing was for the coal to be finely broken, since both experience and laboratory experiments had shown that solid lump coal was almost impervious to air and could not, therefore, generate heat through oxidation.

Generally speaking, for a coal to be dangerous from the point of view of spontaneous combustion it must be friable and readily oxidisable at ordinary temperatures, or be mixed with sufficient pyrites to produce such an absorption of oxygen and consequent heat production as would raise it to a temperature at which the organic constituents commenced to oxidise rapidly. Various researches on the oxidation of coals from different seams throughout the country had shown that coals like anthracite and Welsh steam coals, which had a small capacity for absorbing oxygen, were not likely to fire, that some coals which showed a low rate of oxidation at ordinary temperatures might fire when mixed with pyritic material, and that coals showing a large rate of oxidation, which increased with rise of temperature, might give rise spontaneously to fires. Many bituminous coals were included in the last-mentioned class.

Researches were being continued at several research stations throughout the country, as well as at the mining research laboratory, Birmingham University, which, it was hoped, would throw considerably more light on the whole question.

Gas Companies as Chemical Manufacturers

Action by the Secretary of the Castner-Kellner Co.

In the Chancery Division, on Thursday, Mr. Justice Astbury began the trial of an action by John Lindsay Deuchar, secretary of the Castner-Kellner Alkali Co., and a stockholder in the defendant company, against the Gas Light and Coke Co. for a declaration that the manufacture by the company of any chemical or other substance necessary for the treatment or conversion of any products or residue arising from the making of gas, and the erection of any factory for the purpose of such manufacture were not authorised by the Company's Act of 1868 or any other Act and were *ultra vires* of the company. An injunction was also asked to prevent any such manufacture. Mr. Maugham, K.C., Mr. Hunter Gray, K.C., and Mr. Dighton Pollock appeared for the plaintiff, and Sir John Simon, K.C., Sir Arthur Colefax, K.C., Mr. Wilfrid Greene, K.C., and Mr. Uthwatt for the defendant company.

The Plantiff's Case

Mr. Maugham said the action was brought to prevent the defendant company from manufacturing caustic soda and chlorine for the purposes of the treatment or working up of their residuals. Mr. Deuchar had bought a small quantity of stock of the defendant company for the purpose of raising this particular point in the form of an *ultra vires* action. He was also secretary of the Castner-Kellner Alkali Co. This was the way in which some of the chemical industries of the country were proposing to raise the point that the Gas Light and Coke Co. and other gas companies were not entitled to manufacture substances which they might require for the purpose of treating their residuals. The manufacture of gas necessarily involved the production of a large number of residuals in large quantities, including tar, which was capable of being turned into a great number of things, among others naphthalene. For many years past the defendant company and, he believed, other companies, had been in the habit of working up their residuals, and the defendant company in particular had been in the habit of producing naphthalene from their tar and converting the naphthalene into the well-known chemical product beta-naphthol. For that purpose they had bought the necessary chemicals, including, in particular, caustic soda. It was agreed that to convert naphthalene into beta-naphthol they must have a quantity of caustic soda. In the past the defendants had bought the caustic soda from the Castner-Kellner and other companies, but recently they had conceived the notion that they were entitled to lay down an elaborate and expensive plant on land which they had acquired under the authority of an Act of Parliament, and that they were entitled to act as manufacturers of caustic soda in order that they might apply that substance in treating naphthalene and converting it into beta-naphthol. That raised a very important and serious matter for the chemical industry of the country, because it would not be disputed that the defendants, like other gas companies, were in a very peculiar and exceptional position. In the first place they had a monopoly for the supply of gas within their own area. They had obtained a number of statutory powers and they were entitled to acquire land, and they had been enabled to raise their capital on easy terms. Their main income, which was very large, was no doubt derived from the making of gas, but making a large revenue from gas they could afford to cut the profits if they pleased from any by-product or from any chemical they might manufacture.

His Lordship asked if the plaintiff wished to prevent the defendant company from making profits. It was no use disguising matters; he was bringing the action in the interests of the Castner-Kellner Co.

Sir J. Simon: Or the chemical combine.

Mr. Maugham said that whether there was a combine or not was another matter, but plaintiff's right was a well-recognised one, which was to prevent the company from doing anything which was *ultra vires*. When, however, his lordship said that the plaintiff was bringing his action to prevent the defendant company from making profits he was rather assuming something.

His Lordship: I only put it generally. I suppose the profits made by this gas company by treating its residual products might be very great.

Mr. Maugham agreed, but, on the other hand, the company might be carrying on this particular branch of work at a loss. They did not object, he said, to the company buying caustic soda and converting their residuals, but they objected to the company making their own caustic soda for that purpose.

Expert Evidence

Mr. Ballantyne, consulting chemist, the first witness, gave a description of the process of making coal gas, and said that at no stage in the production of gas was caustic soda or chlorine obtained.

In reply to Sir J. Simon he said that assuming that the defendant company were going to make caustic soda by the electrolytic process, that process was a proper one.

Defendant Company's Position

This closed the plaintiff's case. Sir J. Simon said that the question for the court was one of construction and law and there was only one fact he had to prove—namely, that the defendants did not and never had attempted to sell any caustic soda; and that all they were doing was to produce by electrolytic plant caustic soda—and, incidentally, chlorine in a very limited quality—which was not more than sufficient to treat the naphthalene which was a residuum.

Mr. John Henry Olliver, salesman to the defendant company, said that they had never sold or attempted to sell any caustic soda that they produced The capacity of the electrolytic plant which the company had set up was not more than sufficient to provide caustic soda as a reagent in converting the naphthalene.

Sir J. Simon, addressing the court for the defendants, said it had been proved, among other things, that their only object was to produce caustic soda and to do so by an approved method.

The hearing was adjourned.

Manchester Chemical Merchant's Affairs

The creditors of Alfred Johnson, chemical and colour merchant, Bromley Street, Clayton, and Silverdale, Grange Avenue, Levenshulme, were called together recently, when a statement of affairs was presented which showed liabilities of £7,199 14s. 1d. The indebtedness to the trade was £1,421 6s. 11d., and there were cash creditors for £1,235 8s. 4d. There were also partly secured creditors for £12,462 18s. 10d., who helds ecurities valued at £7,920, and were shown as unsecured for the balance of £4,542 18s. 10d. The assets were estimated to realise £2,562 11s. 8d., from which had to be deducted £213 17s. 7d. for preferential claims, leaving net assets of £2,348 14s. 1d., or a deficiency of £4,851. It was stated that the partly secured creditors were the bank, their claim being in respect of an overdraft. The securities they held consisted of a charge on certain land, buildings, fixed machinery and plant, which had been valued for the purposes of the statement at £6,820.

It was reported that the debtor was formerly a partner in a chemical concern, and in 1917 he purchased the present business, paying £10,000 in cash, and had since expended a further £9,000 on new machinery and other improvements. It was believed that formerly the business was a good one, but during recent years it had not been successful, and since 1920 losses had been incurred. A deficiency account was presented, and this showed that the debtor's capital on March 31st, 1920, was £18,707, while £1,460 in cash had since been paid into the business. With the deficiency of £4,851 in the statement of affairs there was £25,018 to be accounted for. That amount was explained by the losses on trading together with the drawings and the writing off of land, buildings and plant of £15,641, whilst certain amounts had been written off the assets in the statement of affairs. During the year ended March, 1919, the turnover was £25,520, whilst in the following year the sales were £32,266. In the succeeding twelve months the turnover fell to £29,870, whilst during the year to March, 1922, the turnover declined to £13,102, and in the following year it fell to £8,170. During the nine months to December last the sales were only £4,198. There was a trading loss for the period ended December 31st, 1921, of £1,738, whilst in the following year there was a loss of £2,352, and in 1923 a loss of rather more than £3,000.

No offer of a composition was submitted, and the creditors decided that the matter should be dealt with under a deed of assignment, with Mr. T. Dutton, 4, Piccadilly, Manchester, as trustee, together with a committee of three of the principal creditors.

From Week to Week

MR. ROBERT GILLESPIE, whose death occurred on Sunday, was associated with Allan Glen's School, Glasgow, both as pupil and science master for a period of 30 years.

A FIRE OCCURRED early on Friday, January 11, at Barke's Chemical Works, Canning Road, Stratford, London, some acid tanks being involved.

MR. FELIX BRUNNER, only son of Sir John Brunner, M.P. for Southport, has fractured his right leg while ski-ing at Pontresina, Switzerland. He is in hospital at Samaden.

FIVE WORKMEN were severely burned at a carbide factory in Madrid, on Tuesday, when a truck containing liquid carbide overturned and spilled its contents upon them.

THE DEATH TOOK PLACE on Tuesday of Mr. William Cormack, science master in Falkirk High School. A native of Kilrenny, Fifeshire. Mr. Cormack graduated at St. Andrew's University, where also he acted for a time as lecture assistant to the Professor of Chemistry.

DR. EDWARD EMRYS-ROBERTS, who died at Penarth on Tuesday, was a professor of Pathology and Bacteriology in the University of Wales. During the war he commanded the Welsh Mobile Bacteriological Laboratory attached to the First Army in France.

THE FRESCO representing the chemical industries, which Mr. Cosmo Clark is painting for the Chemistry Section of the Wembley Exhibition, promises to be the largest picture in the world, the measurements being 613 ft. by 9 ft.

THE NATIONAL COLLECTION of microbes at the Lister Institute has had many additions this year. There are 250 fresh types, and 3,000 cultures have been distributed. Included in these types are bacteria which are phosporescent, and some which make colouring dyes.

AT THE ANNUAL GENERAL meeting of the British Allied Industries Research Association, held on Friday, January 11, Sir Richard Glazebrook spoke of the growth in the relation between science and industry, and emphasised their close connection and inter-dependence.

THE IMPORTANCE of the products of the United Alkali Co. in agriculture, the textile, glass, soap, metal, leather, dyestuffs, and other dependent industries, are described in an illustrated article published in a special supplement to the *Liverpool Post* and *Mercury* on Monday.

THE LABORATORY for colloid research which has been built at Manchester University as a result of subscriptions raised by a committee under the chairmanship of Mr. Kenneth Lee, will be formally opened on Wednesday next (January 23) by Mr. W. B. Hardy, the secretary of the Royal Society.

THE ANNUAL REPORT of the Medical Research Council, issued on Thursday, January 10, states that the British production of insulin is now sufficient, not only to meet the whole home demand, but also to allow a growing export to other parts of the Empire, and to foreign countries where large scale production has not yet been achieved.

DR. T. J. MURRAY, of Wolverhampton, speaking at the Birmingham Metallurgical Society on Thursday, January 10, said that the outstanding discoveries in the realm of pure science in recent years were probably those connected with the study of the conduction of electricity through gases, radio-activity, and X-ray work.

FROM THE BEGINNING of this year H. H. Rieser and Co., Norwich House, Southampton Street, London, W.C.1, have been appointed sole representatives of the Norse Metal Works, manufacturers of aluminium, brass and copper billets, rods, tubes and wire. The firm also represent the Norse Electro-Chemical Works, carbide of calcium and ferro-silicon manufacturers.

THE BIRMINGHAM AND MIDLAND INSTITUTE conversazione opened most successfully on Tuesday evening. Many hundreds of guests assembled, and the programme, which had many interesting features, included experiments with liquid air, colouring of wool with vegetable dyes, and examples of work done and results obtained in dye research by the Department of Chemistry, Birmingham University.

MR. ERNEST BRANSTON PINNER of Mitcham appeared before the Croydon County Magistrate on Monday, January 7, for the third time, on a charge of falsifying the wages book of his employers, Foster and Gregory, chemical manufacturers, of Lonesome. The sum involved was £19 2s., and the prisoner was placed on probation for 12 months; himself in £50, and one surety of a similar sum.

ARRANGEMENTS HAVE BEEN made between the railway companies and the authorities of the British Empire Exhibition for exhibits to be carried by goods or passenger train at half rates at owner's risk. Similar arrangements will apply to all unsold exhibits returning from Wembley at the close of the Exhibition. Certificates showing that the goods are actually intended for the British Empire Exhibition are being prepared, and these will be sent to exhibitors as soon as the Railway Clearing House has approved of their form.

MR. NELLIES of the National Union of Shaleminers and Oilworkers, in an address before the Colliery Under-Managers' Association, in Glasgow, on Saturday, January 12, referred to the position of the shale industry. He stated that it was probable that this branch of the oil industry might be closed down altogether in the course of a few months, owing to it being a non-paying concern. He explained that his association had passed a resolution calling upon the Government to keep the industry going, subsidising it if necessary from the profits of the Government's holding in the Anglo-Persian Company.

ITALIAN AUTHORITIES are considering the exploitation of volcanic energy, on a large scale, to assist industry. A district lying south of Volterra in Tuscany has been selected, and works for generating electrical power and producing boric acid and other chemicals, have been erected. To use the energy of the volcanic steam available, bore holes are sunk and protected by iron tubing. The temperature of the steam varies from 100° to 190°C. The steam, it is stated, has been shown by Professor R. Nasini to be radio-active and to contain boric acid and certain gases, including methane, ammonia, argon, and helium.

THE BOARD of the British Empire Exhibition announces an important decision on the question of awards. A commemorative medal, accompanied by a decorative certificate, will be awarded to each exhibitor who has rented space in the United Kingdom Section. India, the Dominions, Colonies, Protectorates and Mandated Territories will receive for distribution among their exhibitors a sufficient supply of identical medals and certificates. Exhibitors participating in collective exhibits of products or manufactures organised by the United Kingdom or Overseas Governments, or in Art and Scientific Research exhibits organised by Governments, associations, and committees, will receive a diploma of honour.

DR. F. J. BRISLEE, president of the Liverpool Microscopical Society, lecturing at the Royal Institution, Liverpool, on Friday, January 11, said that he foresaw that in the future the most important fuel would be alcohol made by fermentation from starch, etc., supplied by growing plants. It was imperative that, as the mineral resources of the world were being exhausted, the products of photosynthesis and bacterial action, or fermentation, should be developed. It was becoming ever more obvious that microscopic organisms and their functions were vitally connected with questions concerning the farm, the dairy, food, and other necessities of life, and it seemed desirable that intensive microscopical research should be embarked upon.

A CONFERENCE has been held at Delhi to discuss questions connected with the production, manufacture, and distribution of quinine, and resolutions were adopted advocating a policy of growing cinchona in India on a scale sufficient eventually to supply the full requirements of the country, it being recognised that the present high price of the drug was due to the control of the market by foreign monopoly. It was resolved to recommend to the Government that plantation in Madras, Bengal, and Burma be undertaken, and that the existing factories be extended and modernised. The resolutions, if accepted by the Government, will have no immediate effect on the situation, as plantation takes about eight years to reach maturity.

References to Current Literature

British

PAPER.—The manufacture of newsprint paper. W. C. Munro. *J.S.C.I.*, January 11, 1924, pp. 28–33.

PHOTO-CHEMISTRY.—The physical chemistry of the photographic process. Section III.—Development and characteristics of the developed plate. Plate sensitometry; the behaviour of silver bromide to rays of short wavelength; the under-exposure period of the characteristic curve; the grey wedge and its use in sensitometry; knowns and unknowns in the theory of development; recent progress in the sensitometry of photographic materials; optical properties of the photographic emulsion. *Trans. Faraday Soc.*, November, 1923, pp. 327-385.

HALOGEN COMPOUNDS.—The bromine compounds of phenanthrene. Part II. H. Henstock. *Chem. Soc. Trans.*, December, 1923, pp. 3097–3099.

Quantitative measurements of the reactivity of the halogens in aromatic compounds. A. H. Rheinlander. *Chem. Soc. Trans.*, December, 1923, pp. 3099–3110.

REFRACTORIES.—The use of refractory materials in gas works. G. M. Gill. *Trans. Ceram. Soc.*, Part IV, 1922–1923, pp. 377–392.

The manufacture of refractories in America. A. F. Greaves-Walker. *Trans. Ceram. Soc.*, Part IV, 1922–1923, pp. 358–376.

CERAMICS.—The physical properties of clay. S. E. Ackermann. *Trans. Ceram. Soc.*, Part IV, 1922–1923, pp. 333–343.

Notes on the application of pyrometers to ceramic industries. C. E. Foster. *Trans. Ceram. Soc.*, Part III, 1922–1923, pp. 248–274.

REACTIONS.—The conditions of reaction of hydrogen with sulphur. Part IV. The direct union of oxygen and sulphur. R. G. W. Norrish and E. K. Rideal. *Chem. Soc. Trans.*, December, 1923, pp. 3202–3218.

The interaction of bromine with acetic anhydride. K. J. P. Orton, H. B. Watson and J. E. Bayliss. *Chem. Soc. Trans.*, December, 1923, pp. 3081–3096.

HAFNIUM.—The hafnium content of zirconium ores. G. Hevesy and V. T. Jantzen. *Chem. Soc. Trans.*, December, 1923, pp. 3218–3223.

SULPHIDES.—Studies in the organic polysulphides. Part I. The action of anhydrous potassium pentasulphide on some alkyl halides. R. W. Riding and J. S. Thomas. *Chem. Soc. Trans.*, December, 1923, pp. 3271–3278.

The action of hydrogen sulphide on lithium ethoxide. Lithium hydrosulphide. J. H. Jones and J. S. Thomas. *Chem. Soc. Trans.*, December, 1923, pp. 3285–3294.

RUBBER.—Latex-sprayed rubber. E. Hopkinson. *India-rubber J.*, December 29, 1923, pp. 13–16.

United States

CARBONISATION.—Gas producer methods in carbonising coal. C. H. S. Tupholme. *Chem. Met. Eng.*, December 24, 1923, pp. 1138–1140.

BLEACHING POWDER.—Suggested improvements in chloride of lime manufacture. O. Nydegger. *Chem. Met. Eng.*, December 24, 1923, pp. 1141–1142.

EVAPORATION.—Fundamental principles of multiple effect evaporation. Part II. H. K. Moore. *Chem. Met. Eng.*, December 24, 1923, pp. 1144–1147.

REFRACTORIES.—The analysis of refractories. C. A. Underwood. *J. Amer. Ceram. Soc.*, December, 1923, pp. 1263–1267.

How to get the most out of electric furnace refractories. R. C. Gosrow. *Chem. Met. Eng.*, December 31, 1923, pp. 1181–1185.

CORROSION.—Use of aluminium to prevent steel corrosion. A. V. Farr. *Chem. Met. Eng.*, December 31, 1923, pp. 1188–1189.

MIXING.—Modern mixing methods (for sand-lime mortar). A. W. Allen. *Chem. Met. Eng.*, December 31, 1923, pp. 1186–1188.

PAPER.—Use of de-inked stock in production of book paper. H. J. Payne. *Chem. Met. Eng.*, December 31, 1923, pp. 1176–1180.

CONDENSATIONS.—Condensations of aldehydes with resorcinol and some other aromatic hydroxy compounds. R. N. Sen and N. N. Sinha. *J. Amer. Chem. Soc.*, December, 1923, pp. 2984–2996.

The condensation of aldehydes to esters by aluminium ethoxide. W. C. Child and H. Adkins. *J. Amer. Chem. Soc.*, December, 1923, pp. 3013–3023.

KETENES.—The ketenic decomposition of ketones. Ketene and methyl ketene. C. De W. Hurd. *J. Amer. Chem. Soc.*, December, 1923, pp. 3095–3101.

ANALYSIS.—Investigations on the platinum metals. Part IV. The determination of iridium in platinum alloys by the method of fusion with lead. R. Gilchrist. *J. Amer. Chem. Soc.*, December, 1923, pp. 2820–2828.

French

ACIDS.—The manufacture of sulphuric acid by the contact process. Part XIX. H. Braidy. *L'Ind. Chim.*, December, 1923, pp. 530–532.

ANALYSIS.—Analysis and calorimetry of industrial gases. Part IV. Various apparatus. L. Maugé. *L'Ind. Chim.*, December, 1923, pp. 537–540.

ETHERS.—αγ-Dichloro-alkylpropyl ethers and the corresponding acetals. W. Dulière. *Bull. Soc. Chim.*, November, 1923, pp. 1647–1654.

AMINES.—The preparation of monomethylamine. M. Sommelet. *Compt. rend.*, January 7, 1924, pp. 217–219.

PHOSHATES.—Insoluble alkali metaphosphates. P. Pascal. *Compt. rend.*, January 7, 1924, pp. 211–213.

SPECTROSCOPY.—The ultraviolet absorption spectrum of ammonia gas. M. Ferrières. *Compt. rend.*, January 7, 1924, pp. 202–205.

RUBBER.—The constitution of vulcanised rubber. Part I. F. Boiry. *Le Caoutchouc*, December 15, 1923, pp. 12010–12013.

German

POLYMERISATION.—The polymerisation of *asym*-diphenylethylene. S. W. Lebedew. *Ber.*, December 10, 1923, pp. 2349–2353.

Theory of the formation of cuprene. H. P. Kaufmann and W. Mohnhaupt. *Ber.*, December 10, 1923, pp. 2533–2536.

DOUBLE SALTS.—Some double salts of diazo compounds with lead tetrachloride. E. Sakellarios. *Ber.*, December 10, 1923, pp. 2536–2541.

LIQUID FUEL.—Synthesis of higher members of the aliphatic series from carbon monoxide. F. Fischer and H. Tropsch. *Ber.*, December, 10, 1923, pp. 2428–2443.

DYESTUFFS.—New syntheses of quinone-imide dyestuffs. Part I. Syntheses using 1-chlor-2 : 4-dinitro-naphthalene. Part II: Stereo considerations in the condensation of oxy-quinones with *o*-diamines. Part III: Syntheses of Indulin 3B and 6B. Part IV: The colour of simple quinone-imines. F. Kehrmann. *Ber.*, December 10, 1923, pp. 2385–2405.

PHOTO-CHEMISTRY.—The photo-chemistry of chlorine. F. Weigert and K. Kellermann. *Z. physikal. Chem.*, November 2, 1923, pp. 1–40.

CATALYSIS.—Studies in heterogeneous catalysis. L. Gurwitsch. *Z. physikal. Chem.*, December 5, 1923, pp. 235–248.

Miscellaneous

DOUBLE COMPOUNDS.—The equilibria between some glycols and their acetone compounds. J. Böeseken and P. H. Hermans. *Rec. Trav. Chim. des Pays-Bas*, December 15, 1923, pp. 1104–1110.

TRIPLE COMPOUNDS.—Triple salts. F. Ephraim. *Helv. Chim. Acta*, December 1, 1923, pp. 920–935.

ANALYSIS.—The quantitative determination of fluorine in organic compounds. J. Piccard and C. Buffat. *Helv. Chim. Acta*, December 1, 1923, pp. 1047–1048.

A titrimetric micro-method for the estimation of sodium. H. Müller. *Helv. Chim. Acta*, December 1, 1923, pp. 1152–1161.

Patent Literature

Abstracts of Complete Specifications

208,189. HYDROGENATION OF OILS AND FATS. Lever Bros., Ltd., Port Sunlight, Cheshire, and R. Thomas, "The Moorings," Dacre Hill, Rock Ferry, Cheshire. Application date, August 8, 1922.

In the hardening of liquid fats and oils, by treating with hydrogen in the presence of a catalyst, it is found that the hardening does not readily take place if the oil has been kept for some time, and the object is to avoid this difficulty. The oil or fat is mixed while fresh with small quantities of phenolic substances such as hydroquinone, guaiacol, and resorcinol. As an example, whale oil may be treated with 0·1 per cent. of hydroquinone by mixing the latter with a portion of warm whale oil, and adding this to the bulk of the oil. When the hardening is subsequently carried out, the rate is found to be accelerated. The phenolic substance may be removed from the oil after hardening by washing with hot water, or by refining with alkali. The oil thus treated may be kept for an indefinite period without appreciable falling off in its susceptibility to hydrogenation. Several detailed examples are given.

208,193. SYNTHETIC RESINS, AND PROCESS FOR MAKING SAME. A. E. Alexander, London. From J. S. Stokes, Spring Valley Farms, Montgomery Co., Pa., U.S.A. Application date, August 11, 1922.

Synthetic resins which are soluble and capable of reacting further, or insoluble and infusible, are made by condensing phenol with a suitable carbohydrate such as ground corn cob, sawdust, etc., then adding a methylene hardening agent, and then subjecting the mixture to combined heat and pressure. The carbohydrates used include vegetable products in a natural state, or those which have been treated without altering their chemical nature. It is not necessary to extract from the vegetable material products such as formaldehyde or furfural, and to use these separately in the process. The resins may have any degree of fluidity from a thin syrup to a hard infusible resin of great strength. The resins may be used as shellac substitutes for making varnishes and for dielectric purposes. Any cheap cellulose products may be used as raw materials, and also other polyoses such as gum arabic, cherry gum, dextrin, starch, cane sugar, vegetable ivory nut, etc. All the cellulose and pentanose are dissolved and combined in an acidulated anhydrous phenol solution in a few minutes. The resin produced may be converted into the hard and infusible form while the acid catalyst is still present, or after it has been neutralised with lime or ammonia. Formaldehyde or its amide acts as a quick hardening agent with an acid or basic catalyst or in a neutral medium. Other hardening agents used may be hexamethylene-triphenol, the aniline hydrachloride product of formaldehyde, or the double chlorides of hexamethylene tetramine. The material is readily soluble in alcohol, acetone, furfural, formaldehyde, and the usual synthetic resin solvents. It may be precipitated as a finely divided suspension by means of aluminium sulphate. Similar resinous products may be obtained by the use of cresol, resorcinal, naphthol, and their homologues, and by using all carbohydrates which upon hydrolysis yield a monose. Several detailed examples are given.

208,235. RUBBER, MANUFACTURE OF. P. Schidrowitz, 57, Chancery Lane, London, W.C.2. Application date, September 14th, 1922. Addition to 193,451.

Specification No. 193,451 (see THE CHEMICAL AGE, Vol. VIII, p. 348) describes the manufacture of vulcanised rubber compositions by submitting uncoagulated latex to vulcanisation by means of sulphur or other vulcanising agent under conditions which preclude coagulation during vulcanisation. In this invention, the latex mixing is vulcanised at a temperature below that usually employed. A vulcanisation accelerator is also used, such as piperidine or its derivatives. The mixture may be left to stand at ordinary temperature, or may be heated on a water bath, or the process may be commenced at about 15° C., and the vulcanisation completed by heating. Coagulation of the latex during vulcanisation is prevented by rendering the mixture definitely alkaline or basic prior to treatment, by the addition of ammonia or like base, or by adding sufficient accelerator such as piperidine, or the alkali may be present in the vulcanising agent, *e.g.*, as an alkaline polysulphide. The vulcanised rubber component may separate from the aqueous mixture in a coalesced but not coagulated form, *i.e.*, in a form which is reversible to form a suspension by stirring. The vulcanised product may be separated by evaporating the liquid, or by adding coagulants such as a solution of magnesium sulphate, or sulphuric or acetic acids. The separated material may be washed, milled, sheeted, etc., in the same manner as any known rubber coagulum. An example is given of the treatment of latex with sodium polysulphide and an accelerator consisting of zinc oxide containing 6 per cent. of piperidyl dithiocarbamate of piperidine. Several examples of other similar products are given.

In the preparation of rubber compositions by the direct vulcanisation of uncoagulated latex, the use of the usual rubber solvents is avoided. There is thus no danger of fire in the impregnation of coating of fabrics, and the usual odour possessed by rubber obtained by evaporating solutions is absent. Further, the low temperature vulcanisation which may be employed avoids the use of pressure heating or closed vessels, since the temperature employed does not exceed 100° C., and may be ordinary atmospheric temperature.

208,247.—CONCENTRATING LIQUORS TO HIGH DENSITIES, APPARATUS FOR. A. Blair and Blair, Campbell and McLean, Ltd., Woodville Street, Govan, Glasgow. Application date, September 20, 1922.

The apparatus is particularly suitable for the continuous production of solid, semi-solid, or very viscous extract. The liquid is supplied by a pump to a calandria, the tubes of which are horizontal and are heated by steam. Vapour is generated in the tubes, and the liquid thus passes through them at high velocity. The mixture then passes into a separator in which a partial vacuum is maintained by means of an air pump, and the concentrated liquor is discharged continuously from the separator by means of a rotary valve which does not allow the vacuum to be destroyed. The liquid passes into a recess in the valve, which on rotation of 180° is placed into communication with fluid under pressure to discharge the liquid in the recess.

208,265.—TETRAKISAZO DYESTUFFS, MANUFACTURE OF. A. G. Bloxam, London. From Akt.-Ges. für Anilin Fabrikation, Berlin-Treptow, Germany. Application date, September 27, 1922.

These dyestuffs correspond with the general formula :— A-azo➤M^{I}—azo➤M^{II}—azo➤M^{III}—azo➤E, where A is a residue of an amino sulphonic acid of the benzene or naphthalene series, M^{I} and M^{II} are residues of middle components of the aromatic series (except residues of amino-benzoyl-amino-naphthol sulphonic acids), M^{III} is a residue of an amino-oxynaphthalene sulphonic acid or the residue of a middle component of the benzene series, and E is a compound which may be coupled with a diazo compound, *e.g.*, an oxy-, amino-, amino-oxy-compound of the aromatic series, or a compound containing the group $CO.CH_2$ (*e.g.*, pyrazolones) α-methyl-indole, 1 : 3-dioxyquinoline, and the like. These dyestuffs are obtained by diazotising an aminoaryl-sulphonic acid, combining the diazo compound with a middle component of the benzene or naphthalene series (except those residues specified above), diazotising the product, and combining it with the middle component of the benzene or naphthalene series (except those specified above), diazotising again, and combining with an amino-oxynaphthalene sulphonic acid or with a middle component of the benzene series, diazotising a fourth time, and combining with a compound capable of being coupled with a diazo compound. The dyestuffs which contain in the fourth place a middle component of the benzene series, and in the fifth place a nitro-metadiamine of the benzene series are brown ; those containing in the fourth place an amino-oxy-naphthalene sulphonic acid, and in the fifth place a nitro-metadiamine of the benzene series are green ; those containing in the fourth place an amino-oxynaphthalene sulphonic acid, and in the fifth place a compound other a nitro-metadiamine of the benzene series are blue to grey. Several examples of the preparation of these dyestuffs are given.

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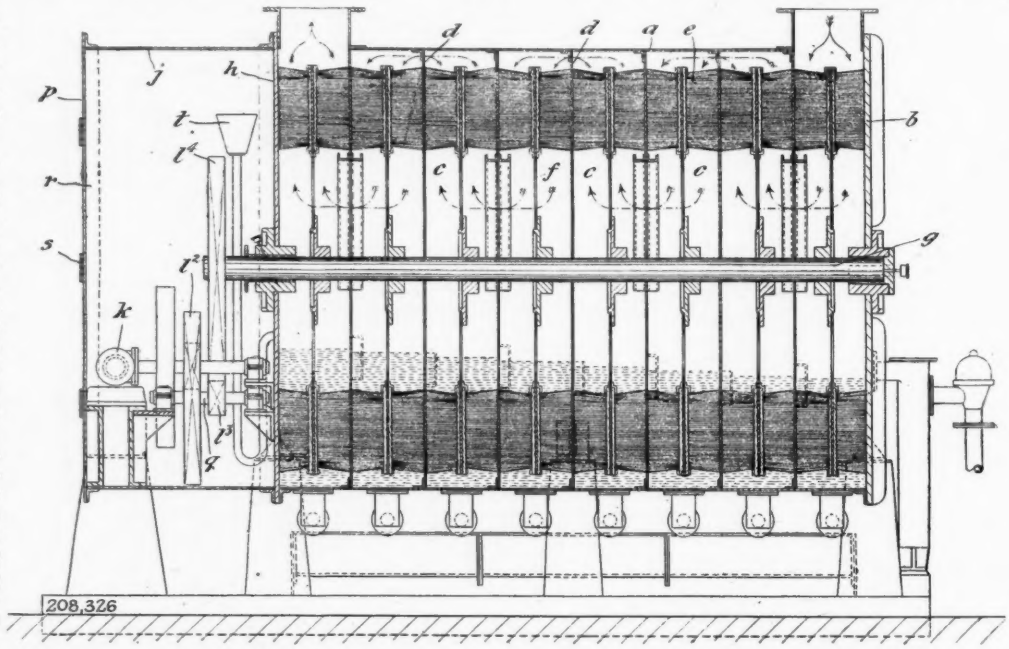
208,326.—Bringing Liquids and Gases into Intimate Contact, Apparatus for. W. C. Holmes and Co., Ltd., D. M. Henshaw, and J. Whittell, Whitestone Iron Works, Huddersfield. Application date, November 7, 1922.

This apparatus is a rotary gas washer or scrubber of the kind described in Specification No. 162,166 (See The Chemical Age, Vol. IV, p. 626), in which a number of brush or similar devices are mounted on a rotary member within a cylindrical casing containing the liquid into which the brushes dip. The shaft of such a gas washer is usually driven at a reduced speed by means of gearing from an engine or motor, and in this invention the engine and gearing are contained within an extension of the cylinder of the washer, to protect them from acid and other vapours. A casing *a* is divided into a number of chambers *c* by diaphragms *d*, and these chambers contain discs *f*, which are mounted on a rotating shaft *g* and carry brushes *e* which dip into the liquid. The end of the casing is closed by disc *h*, beyond which it is extended at *j* forming a chamber which contains the engine *k*, and reduction gearing l^2, l^3, l^4. A filling inlet *t* is also contained within this chamber.



Note.—Abstracts of the following specifications which are now accepted, appeared in The Chemical Age when they became open to inspection under the International Convention. 189,091 (Barrett Co.) relating to the manufacture of benzaldehyde (see Vol. VIII., p. 102); 195,950 (L'Air Liquide Soc. Anon, pour l'Etude et l'Exploitation des Procédés G. Claude) relating to separation of the constituents of gaseous mixtures containing hydrogen (see Vol. VIII., p. 626); 195,619 (Textilwerk Horn Akt.- Ges.) relating to the manufacture of a cellulose compound indifferent to substantive colours (see Vol. VIII., p. 625); 196,272 (Farbwerke vorm. Meister, Lucius, and Brüning) relating to conversion of halogen substitution products of hydrocarbons into hydrocarbons or other halogen substitution products containing a higher number of carbon atoms (see Vol. VIII., p. 654); 199,007 (Compagnie de Bethune) relating to production of sulphovinic acid from ethylene (see Vol. IX., p. 180; 204,302 (A. B. Emery) relating to concentration of ores (see Vol. IX., p. 581).

International Specifications not yet Accepted

206,484. Purifying Hydrocarbons. Barrett Co., 40, Rector Street, New York. (Assignees of D. F. Gould, Riverton, N.J., U.S.A.) International Convention date, November 3, 1922.

The process is for purifying hydrocarbons such as naphthalene, fluorene, acenaphthene, etc. The crude material is treated with sulphuric acid, and the spent acid drawn off. The material is washed with hot water, and the molten hydrocarbon run into a crystallising tank containing an alkali such as caustic soda. Crystallisation is effected by adding cold water. The quantity of caustic soda should be in excess of that required to neutralise the residual acidity of the hydrocarbon. The crystals may be washed and redistilled.

206,487. Emulsions of Bismuth Salts. F. Hoffmann-La Roche and Co., Akt.-Ges., 184, Grenzacher Strasse, Basle, Switzerland. International Convention date, November 1, 1922.

Emulsions of bismuth salts of fatty acids in oils such as natural oils, synthetic fatty acid esters and mineral oils, for medical purposes, are obtained by dissolving the salt in a volatile organic solvent, mixing with the oil, and evaporating off the solvent. Suitable solvents are ether, benzene, or petroleum ether. Examples are given of the emulsification of bismuth oleate, the bismuth salt of tariric acid di-iodide, and the bismuth salt of linolic acid.

206,489. Urea. Soc. des Produits Azotés, 2, Rue Blanche, Paris. International Convention date, November 3, 1922. Addition to 189,787.

Specification 189,787 (see The Chemical Age, Vol. VIII. p. 127) describes the concentration of urea in acid solutions under reduced pressures, until only urea crystallises out on cooling. In this invention the condensation is effected at a temperature of 60°–70° C. under a high vacuum to obtain a concentrated solution without decomposition to ammonium salts. Before concentration the solution may be cooled to −10° to −15° C. to separate a eutectic mixture of ice and sulphuric acid monohydrate.

206,498. Nitrogen Oxides. H. G. A. Ramsay, 27, St. Larsgatan, Linköping, Sweden. International Convention date, November 2, 1922.

Calcium cyanamide or a cyanide is burned with air, oxygen, or ozone to obtain oxides of nitrogen. The cyanogen compound may be mixed with lime, quartz, a metallic oxide, or the residue of a previous operation, and is pulverised and injected into a tube heated to 600°–1,000° C. Heating is then discontinued, and cooling may be necessary, the reaction being exothermic. The air or oxygen may be mixed with other gases, and is passed through the tube in counter-current to the solid material.

206,469. Synthetic Resins. Bakelite Ges., 32, Lutzowstrasse, Berlin, and R. Hessen, Erkner, near Berlin. International Convention date, November 4, 1922. Addition to 159,461. (See The Chemical Age, Vol. IV., p. 566.)

Specification 159,461 describes the production of soluble fusible condensation products in two stages. In this invention, volatile bases such as ammonia or dimethylamine are used in the first stage, and organic acids soluble in benzene in the second stage. Such acids are acetic, benzoic, salicylic, stearic, palmitic, oleic, or resin acid, and the products are soluble in benzene and fatty, mineral, or ethereal oils.

206,512. Condensation Products of Formaldehyde with Urea, Thiourea, etc. F. Pollak, 20, Langegasse, Vienna. International Convention date, August 2, 1922.

The object is to avoid the formation of cloudiness in hardened formaldehyde-urea and similar condensation pro-

ducts. This is effected by adding electrolytes to the intermediate condensation products. It is found that the activity of the electrolytes follows the rule that the clarification increases in the order Fe, Al, K, NH_4, Cu, Mg, Zn, Ca, Na, for a constant anion, and in the order sulphate, citrate, oxalate, acetate, chlorate, chloride, carbonate, nitrate, bromide, cyanide, thiocyanate, iodide, salicylate, for a constant cation. An incomplete neutralisation of the hydrogen ions also prevents cloudiness. In an example, urea is condensed with formaldehyde solution and hexamethylenetetramine, and the clear product is mixed with sodium acetate to prevent gelatinisation and concentrated *in vacuo*. The acidity is determined, and the necessary amount of urea then added, and the product heated in a mould to harden it. Cloudiness is prevented by adding, before heating, one of the salts referred to above. The condensing agent may be omitted at the initial stage, and urea and pyridine added to the concentrated product.

206,809. TITANIUM OXIDE. Titanium Pigment Co., Inc., 94, Fulton Street, New York. (Assignees of C. A. Doremus, 57, West 55th Street, New York.) International Convention date, November 8, 1922.)

Ilemenite is treated with hydrofluoric acid, the residue separated, and the solution treated with hydrogen peroxide to oxidise ferrous iron. Potassium hydrate is added to precipitate potassium fluotitanate, fluozirconate, and fluosilicate, which are treated with hot water to dissolve the fluotitanate. Titanium oxide is precipitated from the solution by means of potassium or ammonium hydrate or carbonate, and the hydrofluoric acid, zirconia and silica are recovered from the fluozirconate and fluosilicate. The ferric fluoride obtained at the beginning of the process is treated to obtain fluorides of other metals with elimination of the iron.

206,818. TREATING ARTIFICIAL SILK. R. Clavel, Basle-Augst, near Basle, Switzerland. International Convention date, November 9, 1922.

Cellulose acetate silk threads of fibrous are treated with hot solutions of organic acids such as formic or acetic acid. A protective colloid such as turkey red oil may be added to the solution as a restrainer. Woolly effects are obtained with fibres treated in this manner.

206,822. HYDROGEN. L'Oxhydrique Française, 8, Avenue Jules Ferry, Malakoff, Seine, France. International Convention date, November 7, 1922.

Hydrogen is produced by the iron-steam process, and the iron oxide is reduced by blast furnace gas, coal gas, coke-oven gas, gas from metallurgical plant and other waste gases. The reducing gas is used in excess, and is preheated by the waste gases. Burnt gases are used for heating the ovens, and then pass through the iron oxide, and then to the recuperators. The coke-oven gas or the like, after preheating in the recuperators, passes into the reducing apparatus, and the excess of gas is afterwards used in any part of the plant.

206,831. DYES. Farbwerke vorm. Meister, Lucius, and Brüning, Hoechst-on-Main, Germany. International Convention date, November 10, 1922.

The tetrazo compounds of the diaminodiaryl-dialkylmethanes described in specification 204,722 (see THE CHEMICAL AGE, Vol. IX., p. 638) are coupled with components such as naphthol- or amino-naphthol-sulphonic acids. Examples are given of the coupling of diamino-di-*o*-tolyldimethylmethane and 1-naphthol-5-sulphonic acid; diaminodiphenyldimethylmethane and pyrazolone sulphonic acid; and diaminodiphenyl-methylethylmethane and 1-amino-8-naphthol-4- sulphonic acid.

206,848. CYMENE. G. Austerweil and L. Peufaillit, 50, Boulevard de Menilmontant, Paris. International Convention date, November 8, 1922.

Monocylic terpenes are heated with sulphur and a catalyst which is known to be an accelerator of rubber vulcanisation. The terpenes are thus dehydrogenised for the production of *p*-cymene. In an example, dipentene is heated with sulphur and thiocarbanilide, and the cymene obtained by steam distillation. The distillate may be purified by treating with permanganate solution, steam-distilling, and then distilling over metallic calcium. The products are used for therapeutic purposes.

206,862. ACTIVE CHARCOAL. Naamlooze Vennootschap Algemeene Norit Maatschappij (General Norit Co., Ltd.), 2, Den Texstraat, Amsterdam. (Assignees of J. N. A. Sauer, 2, Den Texstraat, Amsterdam.) International Convention date, May 26, 1922.

The less porous kinds of coal and carbonaceous materials such as brown coal, anthracite, coke produced by low temperature carbonisation of peat, etc., are uniformly pulverised or granulated, and then agitated or suspended in a body of gas, while heating and treating with activating gases. Such gases are steam, carbon dioxide, air, oxygen, burning gases, carbon monoxide, hydrogen, generator gases and oxidising gases. The raw material may first be carbonised, and the volatile products removed. To regenerate spent charcoal, an inert gas is mixed with a small proportion of oxidising gas such as carbon dioxide, steam, oxygen or chlorine, so that the oxidation is substantially limited to the secondary carbon deposited in the pores as a result of distillation. A uniformly active charcoal is obtained.

LATEST NOTIFICATIONS.

209,423. Process for the production of a mixture of camphene and isobornyl esters. Industrial Resinera-Ruth Soc. Anon. January 5, 1923.

209,431. Galvanic element. Shuster-Adams Chemical Co. January 6, 1923.

Specifications Accepted, with Date of Application

193,385. Dyestuffs capable of being chromed, Manufacture of. Soc. of Chemical Industry in Basle. February 18, 1922.

195,366. Hypochlorites, Manufacture of. Mathieson Alkali Works, Inc. March 25, 1922.

195,098 and 195,400. Gases and vapours, Process of separating constituents of mixtures of. Farbwerke vorm. Meister, Lucius and Brüning. March 20, 1922, and March 24, 1922. 195,400 addition to 195,098.

196,935. Concentrating devices. W. Vogelbusch. April 28, 1922.

197,288. Aluminium alloy. A. Geyer. May 2, 1922.

208,751. Cellulose, Manufacture of. F. C. Thornley, F. F. Tapping, and O. Reynard. August 29, 1922.

208,760. Catalytic production of ammonia, Means for electrically heating gases under pressure for use in. J. Y. Johnson. (*Badische Anilin and Soda Fabrik*). September 20, 1922.

208,761. Formaldehyde and carbamide or carbamide derivatives, Manufacture of condensation products of. H. Goldschmidt and O. Neuss. September 20, 1922.

208,764. Zinc, Process for the production of—in reverbatory furnaces. H. Mehner. September 22, 1922.

208,779. Rubber Vulcanisation of. P. C. Rushen. (*Naugatuck Chemical Co.*) September 26, 1922.

208,835. Magnetic separators. H. H. Thompson and A. E. Davies. October 11, 1922.

208,904. Homogeneous mixtures, Process for making. J. E. Pollak. (*J. D. Reidel Akt.-Ges.*) December 16, 1922.

208,911. Starch preparations, Manufacture of. Plauson's (Parent Co.), Ltd. (*H. Plauson*). December 23, 1922.

208,929. Boron containing orès, Process for the treatment of. A. Kelly. January 16, 1922.

Applications for Patents

Aktiebolaget Ferrolegeringar. Production of alloys poor in carbon and silicon. 657. January 9. (Sweden, January 11, 1923.)

Artificial Coal Co. (Hamon Process), Ltd., and Hamon, Count L. de W. Obtaining decolourising, etc., carbon from peat, etc. 646. January 9.

Blair, Campbell, and McLean, Ltd. Evaporation and concentration of liquors. 945. January 12.

British Dyestuffs Corporation, Ltd., Green, A. G., and Napier, O. J. W. Catalytic manufacture of phthalic anhydride, etc. 963. January 12.

Deutsche Celluloid Fabrik. Process of recovering nitric acid from weak nitric liquors. 874. January 11. (Germany, June 15, 1923.)

Deutsche Gold -und Silber-Scheide Anstalt vorm. Roessler and Liebknecht, O. Manufacture of sodium perborate. 884. January 11.

Fabriques de Produits Chimiques de Thann et de Mulhouse. Production of cyanides and their derivatives from alkali-earth cyanamides. 842. January 11. (France, November 24, 1923.)

Harvey, L. C. Production of fertilisers. 888. January 11.

Schuster-Adams Chemical Co. Galvanic element. 466. January 7. (Germany, January 6, 1923.)

Soc. Anon. Compagnie Générale des Produits Chimiques de Louvres. Manufacture of zinc sulphide. 854. January 11. (France, January 11, 1923.)

Thole, F. B. Treatment of liquid hydrocarbons. 878. January 11.

Market Report and Current Prices

Our Market Report and Current Prices are exclusive to THE CHEMICAL AGE, *and, being independently prepared with absolute impartiality by Messrs. R. W. Greeff & Co., Ltd., and Messrs. Chas. Page & Co., Ltd., may be accepted as authoritative. The prices given apply to fair quantities delivered ex wharf or works, except where otherwise stated. The current prices are given mainly as a guide to works managers, chemists, and chemical engineers; those interested in close variations in prices should study the market report.*

London, January 17, 1924.

BUSINESS has been moderately active this week and the demand has shown a broadening tendency.

Prices generally are well maintained.

Export business has been fairly satisfactory.

General Chemicals

ACETONE is in fair request without change in value.

ACID ACETIC is very firm and some satisfactory business has been booked.

ACID CITRIC is unchanged.

ACID FORMIC continues extremely scarce, with practically nothing available on the spot.

ACID LACTIC continues firm and scarce.

ACID OXALIC is a shade firmer and is only in moderate demand.

ACID TARTARIC is steady with a better demand.

BARIUM CHLORIDE has been an active market and the price is firm.

FORMALDEHYDE.—Only a moderate demand is reported.

LEAD ACETATE is in good request and price is maintained.

LEAD NITRATE.—Unchanged.

LIME ACETATE is strong and in active demand.

LITHOPONE price is firm but only a moderate business is reported.

POTASSIUM CAUSTIC AND CARBONATE are unchanged.

POTASSIUM PERMANGANATE is firm and scarce and in good request.

POTASSIUM PRUSSIATE continues easy with a small demand.

SODIUM ACETATE is in good demand on export account at current figures.

SODIUM HYPOSULPHITE is brisk and price very firm.

SODIUM NITRITE is in good demand and price is without change.

SODIUM PRUSSIATE is firmer and business shows a slight tendency to expand.

SODIUM SULPHIDE.—Only a moderate demand is reported, without change in value.

Coal Tar Products

There is no great change in the market for coal tar products. 90% BENZOL is unchanged at 1s. 1d. to 1s. 1½d. per gallon on rails.

PURE BENZOL is also stationary at 1s. 4½d. per gallon to 1s. 5½d. per gallon on rails.

CREOSOTE OIL is quietly firm, and is worth from 8¾d. to 9d. per gallon on rails in the North, while the price in the South is from 9¾d. to 10d. per gallon.

CRESYLIC ACID is in no great demand, and is quoted at 1s. 10d. to 2s. per gallon on rails for the Pale quality 97/99%, while the Dark quality 95/97% is worth from 1s. 6d. to 1s. 8d. per gallon on rails.

SOLVENT NAPHTHA is weak, and is worth from 11d. to 1s. per gallon on rails.

HEAVY NAPHTHA is quiet at 1s. per gallon on rails.

NAPHTHALENES are quiet, and remain unchanged at £7 to £7 10s. per ton for the low grade qualities, £8 to £8 10s for the 74/76 quality, and £8 15s. to £9 per ton for 76/78

Pharmaceutical Chemicals

ACETYL SALICYLIC ACID continues in steady demand; price unchanged.

ACETANILID.—A fair business is reported; price is well maintained.

BARBITONE is slightly in buyers' favour.

BETA NAPHTHOL RESUBLIMED.—Supplies are difficult to locate.

BROMIDES.—A few weak holders who are appearently desirous of selling, have cut the price for a time, but generally the position is quiet, and any revival in the demand should result in higher prices.

EUCALYPTUS OIL is in buyers' favour, due to lack of demand.

MILK SUGAR.—A cheap parcel which is not yet entirely disposed of has held the price back; the general outlook, however, appears to be firm.

PHENAZONE.—Business has been transacted at rates slightly below those previously reported.

VANILLIN has an upward tendency.

Coal Tar Intermediates

Trade has been quiet, and there is nothing of special interest to report.

ALPHA NAPHTHOL.—Price is unchanged with a fair demand.

ALPHANAPHTHYLAMINE is in moderate request.

ANILINE OIL IS lower with a fair demand.

ANILINE SALT is unchanged.

BENZIDINE BASE is slightly more active.

BETA NAPHTHOL.—A slightly better demand is reported.

DIMETHYANILINE.—A fair business has been transacted.

DIPHENYLAMINE has been inquired for and price is firm.

NITRO BENZOLE is unchanged.

PARANITRANILINE is in good request.

"R" SALT has been a better market.

XYLIDINE is unchanged.

PITCH remains quiet, and the demand from abroad has not improved to any extent. To-day's values are:—London, 90s. to 95s. per ton; East and West Coast, 85s. to 90s., per ton, f.o.b.

Sulphate of Ammonia

The demand is fairly satisfactory, both for home trade and export, and prices remain unchanged.

A New American Rubber Process

DEVELOPMENT of a scientific process of manufacturing crude rubber, supplanting the primitive methods practised by the natives in the tropics, is announced through the American Chemical Society. The new method is described in a detailed report of experiments conducted in the New York laboratories of a large rubber company to the Society by Mr. Ernest Hopkinson, of New York, who says that after three years of testing it has been found possible to make rubber by spraying the latex, or sap, of the rubber tree. A disk spray is substituted for the stick or paddle of the native, which coagulated the fluid, the modern process resembling that used in making powdered milk. The product, known as sprayed rubber, is said to be both cheaper and better than that of the natives and may increase the world's rubber supply. An experimental tower for manufacture has been erected in New Durham, N.J., shiploads of the sap, which looks like milk, being brought in tanks from Sumatra where other plants are being built.

The apparatus used is known as the disk spray. In this process the latex is allowed to flow on to a rapidly revolving, horizontally mounted disk, from which it is thrown in an umbrella-shaped spray or mist into a heated current of air or inert gas. The disk is located at the top of a tower, generally of the shape of a hollow pyramid, and the fine spray of rubber globules falling through the hot air or gas settles on the bottom of the unit as a dry, creamy white, spongy mass, which has approximately one-third the apparent density of ordinary crêpe rubber. A current of heated air is forced in at the top of the tower and escapes at the outer edge of the bottom of the unit, carrying the moisture with it. The rubber globules are dried almost instantly and the rubber shows no harmful effect whatever from heat required for evaporation. The heat is supplied from an oil-burning furnacea, nd the temperature at the entrance and exit of the spray unit is easily and carefully controlled. The capacity of the spray unit is from 600 to 800 pounds of dry evaporated rubber per hour, varying with the total solid content of the latex used.

The new product, it is said, is uniform in quality, ages well in cured stocks, gives high tensile strength, cures quickly, and is of broad application in the manufacturing of rubber goods.

Current Market Prices

General Chemicals

	Per	£	s.	d.		£	s.	d.
Acetic anhydride, 90–95%	lb.	0	1	4	to	0	1	5
Acetone oil	ton	80	0	0	to	85	0	0
Acetone, pure	ton	125	0	0	to	126	0	0
Acid, Acetic, glacial, 99–100%	ton	73	0	0	to	74	0	0
Acetic, 80% pure	ton	51	0	0	to	52	0	0
Acetic, 40% pure	ton	26	0	0	to	27	0	0
Arsenic, liquid, 2000 s.g.	ton	85	0	0	to	88	0	0
Boric, commercial	ton	48	0	0	to	52	0	0
Carbolic, cryst. 39–40%	lb.	0	0	11½	to	0	1	0
Citric	lb.	0	1	5	to	0	1	5½
Formic, 85%	ton	64	0	0	to	65	0	0
Hydrofluoric	lb.	0	0	7½	to	0	0	8½
Lactic, 50 vol	ton	39	0	0	to	40	0	0
Lactic, 60 vol	ton	45	0	0	to	47	0	0
Nitric, 80 Tw	ton	23	0	0	to	25	0	0
Oxalic	lb.	0	0	5½	to	0	0	6
Phosphoric, 1.5	ton	35	0	0	to	38	0	0
Pyrogallic, cryst	lb.	0	5	9	to	0	6	0
Salicylic, technical	lb.	0	1	9½	to	0	2	0
Sulphuric, 92–93%	ton	6	0	0	to	7	0	0
Tannic, commercial	lb.	0	2	3	to	0	2	9
Tartaric	lb.	0	1	0½	to	0	1	1
Alum, lump	ton	12	10	0	to	13	0	0
Chrome	ton	23	0	0	to	24	0	0
Alumino ferric	ton	7	0	0	to	7	5	0
Aluminium, sulphate, 14–15%	ton	8	10	0	to	9	0	0
Sulphate, 17–18%	ton	10	10	0	to	11	0	0
Ammonia, anhydrous	lb.	0	1	6	to	0	1	8
880	ton	32	0	0	to	34	0	0
920	ton	22	0	0	to	24	0	0
Carbonate	ton	30	0	0	to	32	0	0
Chloride	ton	50	0	0	to	55	0	0
Muriate (galvanisers)	ton	32	0	0	to	33	0	0
Nitrate (pure)	ton	40	0	0	to	45	0	0
Phosphate	ton	63	0	0	to	65	0	0
Sulphocyanide, commercial 90%	lb.	0	1	1	to	0	1	3
Amyl acetate, technical	ton	280	0	0	to	300	0	0
Arsenic, white powdered	ton	66	0	0	to	68	0	0
Barium, carbonate, Witherite	ton	5	0	0	to	6	0	0
Carbonate, Precip	ton	15	0	0	to	16	0	0
Chlorate	ton	65	0	0	to	70	0	0
Chloride	ton	14	10	0	to	15	0	0
Nitrate	ton	33	0	0	to	35	0	0
Sulphate, blanc fixe, dry	ton	20	10	0	to	21	0	0
Sulphate, blanc fixe, pulp	ton	10	5	0	to	10	10	0
Sulphocyanide, 95%	lb.	0	0	11	to	0	1	0
Bleaching powder, 35–37%	ton	10	0	0	to	10	10	0
Borax crystals, commercial	ton	25	0	0	to	—		
Calcium acetate, Brown	ton	13	0	0	to	14	0	0
Grey	ton	22	0	0	to	23	0	0
Carbide	ton	13	0	0	to	13	10	0
Chloride	ton	5	15	0	to	6	0	0
Carbon bisulphide	ton	35	0	0	to	40	0	0
Casein technical	ton	80	0	0	to	90	0	0
Cerium oxalate	lb.	0	3	0	to	0	3	6
Chromium acetate	lb.	0	1	1	to	0	1	3
Cobalt acetate	lb.	0	6	0	to	0	6	6
Oxide, black	lb.	0	9	6	to	0	10	0
Copper chloride	lb.	0	1	1	to	0	1	2
Sulphate	ton	25	0	0	to	25	10	0
Cream Tartar, 98–100%	ton	86	0	0	to	88	0	0
Epsom salts (*see* Magnesium sulphate)								
Formaldehyde, 40% vol	ton	63	0	0	to	64	0	0
Formusol (Rongalite)	lb	0	1	11	to	0	2	0
Glauber salts, commercial	ton	4	0	0	to	4	10	0
Glycerin crude	ton	65	0	0	to	67	10	0
Hydrogen peroxide, 12 vols	gal	0	2	0	to	0	2	1
Iron perchloride	ton	18	0	0	to	20	0	0
Sulphate (Copperas)	ton	3	10	0	to	4	0	0
Lead acetate, white	ton	44	0	0	to	46	0	0
Carbonate (White Lead)	ton	50	0	0	to	52	0	0
Nitrate	ton	44	10	0	to	45	0	0
Litharge	ton	37	0	0	to	39	0	0
Lithophone, 30%	ton	22	10	0	to	23	0	0
Magnesium chloride	ton	3	10	0	to	3	15	0
Carbonate, light	cwt	2	10	0	to	2	15	0
Sulphate (Epsom salts commercial)	ton	5	15	0	to	6	0	0
Sulphate (Druggists')	ton	8	0	0	to	9	0	0
Manganese Borate, commercial	ton	65	0	0	to	75	0	0
Sulphate	ton	45	0	0	to	50	0	0
Methyl acetone	ton	82	0	0	to	85	0	0
Alcohol, 1% acetone	ton	80	0	0	to	85	0	0
Nickel sulphate, single salt	ton	37	0	0	to	38	0	0
Ammonium sulphate, double salt	ton	37	0	0	to	38	0	0
Potash, Caustic	ton	33	0	0	to	34	0	0
Potassium bichromate	lb.	0	0	5½	to	—		
Carbonate, 90%	ton	30	0	0	to	31	0	0
Chloride, 80%	ton	9	0	0	to	10	0	0
Chlorate	lb.	0	0	3½	to	—		
Metabisulphite, 50–52%	ton	65	0	0	to	70	0	0
Nitrate, refined	ton	38	0	0	to	40	0	0
Permanganate	lb.	0	0	10½	to	0	0	10½
Prussiate, red	lb.	0	2	8	to	0	2	10
Prussiate, yellow	lb.	0	0	9½	to	0	0	10
Sulphate, 90%	ton	10	0	0	to	10	10	0
Salammoniac, firsts	cwt.	2	15	0	to	—		
Seconds	cwt.	2	17	6	to	—		
Sodium acetate	ton	25	0	0	to	25	10	0
Arsenate, 45%	ton	45	0	0	to	48	0	0
Bicarbonate	ton	10	10	0	to	11	0	0
Bichromate	lb.	0	0	4½	to	—		
Bisulphite, 60–62%	ton	21	0	0	to	23	0	0
Chlorate	lb.	0	0	2¾	to	0	0	3
Caustic, 70%	ton	17	10	0	to	18	0	0
Caustic, 76%	ton	18	10	0	to	19	0	0
Hydrosulphite, powder	lb.	0	1	5	to	0	1	6
Hyposulphite, commercial	ton	10	10	0	to	11	0	0
Nitrite, 96–98%	ton	31	0	0	to	32	0	0
Phosphate, crystal	ton	16	0	0	to	16	10	0
Perborate	lb.	0	0	11	to	0	1	0
Prussiate	lb.	0	0	6	to	—		
Sulphide, crystals	ton	8	10	0	to	9	0	0
Sulphide, solid, 60–62 %	ton	15	0	0	to	16	10	0
Sulphite, cryst	ton	11	10	0	to	12	0	0
Strontium carbonate	ton	50	0	0	to	55	0	0
Nitrate	ton	50	0	0	to	55	0	0
Sulphate, white	ton	6	10	0	to	7	10	0
Sulphur chloride	ton	25	0	0	to	27	10	0
Flowers	ton	11	0	0	to	11	10	0
Roll	ton	9	15	0	to	10	10	0
Tartar emetic	lb.	0	0	11½	to	0	1	0
Tin perchloride, 33%	lb.	0	1	1	to	0	1	2
Perchloride, solid	lb.	0	1	3	to	0	1	4
Protochloride (tin crystals)	lb.	0	1	4	to	0	1	5
Zinc chloride 102° Tw	ton	20	0	0	to	21	0	0
Chloride, solid, 96–98%	ton	25	0	0	to	30	0	0
Oxide, 99%	ton	42	0	0	to	45	0	0
Dust, 90%	ton	50	0	0	to	55	0	0
Sulphate	ton	15	0	0	to	16	0	0

Pharmaceutical Chemicals

Acetyl salicylic acid	lb.	0	3	9	to	0	4	0
Acetanilid	lb.	0	3	3	to	0	3	6
Acid, Gallic, pure	lb.	0	3	0	to	0	3	3
Lactic, 1.21	lb.	0	2	10	to	0	3	3
Salicylic, B.P.	lb.	0	2	6	to	0	2	8
Tannic, leviss	lb.	0	3	2	to	0	3	4
Amidol	lb.	0	7	6	to	0	8	0
Amidopyrin	lb.	0	14	0	to	0	14	6
Ammon ichthosulphonate	lb	0	1	10	to	0	2	0
Barbitone	lb.	0	17	0	to	0	17	6
Beta naphthol resublimed	lb.	0	3	0	to	0	3	6
Bromide of ammonia	lb.	0	0	10½	to	0	1	0
Potash	lb.	0	0	8½	to	0	0	9
Soda	lb.	0	0	9½	to	0	0	10½
Caffeine, pure	lb.	0	12	3	to	0	12	9
Calcium glycerophosphate	lb.	0	5	9	to	0	6	0
Lactate	lb.	0	2	3	to	0	2	6
Calomel	lb.	0	3	9	to	0	4	0
Chloral hydrate	lb.	0	4	3	to	0	4	6
Cocaine alkaloid	oz.	1	0	0	to	1	1	0
Hydrochloride	oz.	0	17	0	to	0	17	6
Corrosive sublimate	lb.	0	3	3	to	0	3	6
Eucalyptus oil, B.P. (70–75% eucalyptol)	lb.	0	2	6	to	0	2	7
B.P. (75–80% eucalyptol)	lb.	0	2	6	to	0	2	8
Guaiacol carbonate	lb.	0	13	6	to	0	14	0
Liquid	lb.	0	12	6	to	0	13	0
Pure crystals	lb.	0	13	0	to	0	13	6
Hexamine	lb.	0	4	3	to	0	4	6
Hydroquinone	lb.	0	4	3	to	0	4	6
Lanoline anhydrous	lb.	0	0	7	to	0	0	6
Lecithin ex ovo	lb.	1	5	0	to	1	7	6
Lithi carbonate	lb.	0	10	0	to	0	10	6
Methyl salicylate	lb.	0	3	0	to	0	3	6
Metol	lb.	0	9	0	to	0	10	0
Milk sugar	cwt	4	0	0	to	4	5	0
Paraldehyde	lb.	0	1	7	to	0	1	9
Phenacetin	lb.	0	7	6	to	0	8	0
Phenazone	lb.	0	8	3	to	0	8	6
Phenolphthalein	lb.	0	8	3	to	0	8	6
Potassium sulpho guaiacolate	lb.	0	7	3	to	0	7	9
Quinine sulphate, B.P.	oz.	0	2	3	to	—		

	Per	£	s.	d.		£	s.	d.
Resorcin, medicinal	lb.	0	5	9	to	0	6	0
Salicylate of soda powder	lb.	0	3	0	to	0	3	3
Crystals	lb.	0	3	0	to	0	3	3
Salol	lb.	0	4	0	to	0	4	3
Soda Benzoate	lb.	0	3	6	to	0	3	9
Sulphonal	lb.	0	17	0	to	0	18	0
Terpene hydrate	lb.	0	1	9	to	0	2	0
Theobromine, pure	lb.	0	12	0	to	0	12	3
Soda salicylate	lb	0	8	6	to	0	9	0
Vanillin	lb.	1	4	0	to	1	5	0
Coal Tar Intermediates, &c.								
Alphanaphthol, crude	lb.	0	1	9	to	0	2	0
Refined	lb.	0	2	3	to	0	2	6
Alphanaphthylamine	lb.	0	1	6½	to	0	1	7
Aniline oil, drums extra	lb.	0	0	8½	to	0	0	8¾
Salts	lb.	0	0	9	to	0	0	9½
Anthracene, 40–50%	unit	0	0	8½	to	0	0	9
Benzaldehyde (free of chlorine)	lb.	0	2	9	to	0	3	0
Benzidine, base	lb.	0	4	6	to	0	4	9
Sulphate	lb.	0	3	6	to	0	3	9
Benzoic acid	lb.	0	2	0	to	0	2	3
Benzyl chloride, technical	lb.	0	2	0	to	0	2	3
Betanaphthol	lb.	0	1	1	to	0	1	2
Betanaphthylamine, technical	lb.	0	4	0	to	0	4	3
Crocein Acid, 100% basis	lb.	0	3	3	to	0	3	6
Dichlorbenzol	lb.	0	0	9	to	0	0	10
Diethylaniline	lb.	0	4	6	to	0	4	9
Dinitrobenzol	lb.	0	1	1	to	0	1	2
Dinitrochlorbenzol	lb.	0	0	11	to	0	1	0
Dinitronaphthalene	lb.	0	1	4	to	0	1	5
Dinitrotoluol	lb.	0	1	3	to	0	1	4
Dinitrophenol	lb.	0	1	6	to	0	1	7
Dimethylaniline	lb.	0	2	8	to	0	2	10
Diphenylamine	lb.	0	3	3	to	0	3	6
H-Acid	lb.	0	4	6	to	0	4	9
Metaphenylenediamine	lb.	0	4	0	to	0	4	3
Monochlorbenzol	lb.	0	0	10	to	0	1	0
Metanilic Acid	lb.	0	5	9	to	0	6	0
Metatoluylenediamine	lb.	0	4	0	to	0	4	3
Monosulphonic Acid (2.7)	lb.	0	8	6	to	0	9	6
Naphthionic acid, crude	lb.	0	2	4	to	0	2	6
Naphthionate of Soda	lb.	0	2	4	to	0	2	6
Naphthylamine-di-sulphonic-acid	lb.	0	4	0	to	0	4	3
Neville Winther Acid	lb.	0	7	3	to	0	7	9
Nitrobenzol	lb.	0	0	7	to	0	0	8
Nitronaphthalene	lb.	0	0	11½	to	0	1	0
Nitrotoluol	lb.	0	0	8	to	0	0	9
Orthoamidophenol base	lb.	0	12	0	to	0	12	6
Orthodichlorbenzol	lb.	0	1	0	to	0	1	1
Orthotoluidine	lb.	0	0	10	to	0	0	11
Orthonitrotoluol	lb.	0	0	3	to	0	0	4
Para-amidophenol, base	lb.	0	8	6	to	0	9	0
Hydrochlor	lb.	0	7	6	to	0	8	0
Paradichlorbenzol	lb.	0	0	9	to	0	0	10
Paranitraniline	lb.	0	2	7	to	0	2	9
Paranitrophenol	lb.	0	2	3	to	0	2	6
Paranitrotoluol	lb.	0	2	9	to	0	3	0
Paraphenylenediamine, distilled	lb.	0	12	0	to	0	12	6
Paratoluidine	lb.	0	5	6	to	0	5	9
Phthalic anhydride	lb.	0	2	6	to	0	2	9
Resorcin technical	lb.	0	4	0	to	0	4	3
Sulphanilic acid, crude	lb.	0	0	9	to	0	0	10
Tolidine, base	lb.	0	7	3	to	0	7	9
Mixture	lb.	0	2	6	to	0	2	9

Essential Oils and Synthetics

Essential Oils.		£	s.	d.
Anise	c.i.f. 1/9 spot	0	1	10
Bay		0	12	0
Bergamot	dearer	0	13	6
Cajaput		0	3	3
Camphor, white	per cwt.	4	0	0
Brown	„	3	15	0
Cassia	rather firmer, c.i.f. 5/6 spot	0	8	0
Cedarwood		0	1	6
Citronella (Ceylon)	easier c.i.f. 3/8 spot	0	3	11
(Java)	c.i.f. 4/4 spot	0	4	7
Clove		0	9	6
Eucalyptus		0	2	4
Geranium Bourbon		1	16	0
Lavender		1	6	0
Lavender Spike		0	4	0
Lemon	dearer	0	3	0
Lemongrass	per oz.	0	0	2½
Lime (distilled)	dearer	0	4	3
Orange sweet (Sicilian)	„	0	11	6
(West Indian)	„	0	9	0
Palmarosa		0	18	0
Peppermint (American)		0	16	0
Mint (dementholised Japanese)		0	13	0
Patchouli		1	5	0
Otto of Rose	per oz.	1	15	0
Rosemary		0	1	11
Sandalwood		1	5	0
Sassafras	scarce and firm	0	9	9
Thyme	2/6 to	0	8	0
Synthetics				
Benzyl acetate	per lb.	0	3	3
Benzoate	„	0	3	6
Citral	„	0	10	0
Coumarine	„	1	0	0
Heliotropine	„	0	8	0
Ionone	„	1	5	0
Linalyl acetate	„	1	2	6
Methyl salicylate	„	0	3	0
Musk xylol	„	0	18	0
Terpeniol	„	0	2	9

Conditions in Germany

Commerce and Industry During December

A REVIEW forwarded by the Commercial Secretary at Berlin (Mr. J. W. F. Thelwall) to the Department of Overseas Trade based on the reports of the Prussian Chambers of Commerce, on the state of trade and industry during December, states that the economic situation showed a slight improvement as compared with November. The stabilisation of the mark, the issue of a sufficient quantity of stable currency, and the almost general introduction of gold mark prices enforced exact calculation, and thus brought some stability and order once more into the whole of business life, and dispelled unrest with regard to wages. Increased output in practically all branches of industry contributed towards reducing prices, so that some improvement in foreign trade was also made possible. As regards agriculture, the reluctance of farmers to deliver cereals and slaughter cattle was overcome by the introduction of gold mark calculation, and by the burden of taxation, which latter compelled them to resort to extensive sales of their products. In Occupied Territory also a slow decline of the enormous amount of unemployment was recorded.

Potash, Metals and Chemicals

The stagnation of sales in the potash industry continued throughout December, but foreign sales were slightly better.

In Upper Silesia the stabilisation of the currency greatly relieved the scrap iron market. German prices were again below the world's market level. As to finished iron, business has not yet revived. The substantial reduction in the price of Upper Silesian rolled products also failed to improve the situation. The few orders on the market were strongly competed for by Czecho-Slovakia. Orders from the waggon factories fell off, the railways having withdrawn their orders from the latter.

The situation in the zinc industry changed but little. Though the demand from abroad was lively, business was rendered very difficult by the strong under-bidding of competitive industries.

Tin was subject to heavy price fluctuations, but reached the highest level recorded this year on December 12—namely, about £240 per ton.

According to the reports of the Halle, Görlitz, and Wiesbaden Chambers of Commerce, a portion of the chemical works were still well employed; others had to work subject to considerable restrictions and could only raise with difficulty money for the payment of wages and salaries. In the chemical preparations industry business revived slightly. Foreign sales, however, continued to fall off. In Occupied Territory, owing to the interruption of goods traffic within that area and to unoccupied Germany, an extension of activities was out of the question.

Activated Carbon

MR. F. COLIN SUTTON, in reply to recent inquiries as to sources of activated carbon, states that the British Super-Carbon Co., Ltd., London, manufacture a high grade activated carbon which they are marketing under the trade name of "Nobrac."

"We note with regret," he adds, "that it appears customary for English manufacturers using activated carbon to refer to continental brands as their standard for comparison. Now that equally high-grade carbon is being manufactured in this country we feel they would be better advised to take as their standard a British product."

Scottish Chemical Market

The following notes on the Scottish Chemical Market are specially supplied to* THE CHEMICAL AGE *by Messrs. Charles Tennant and Co., Ltd., Glasgow, and may be accepted as representing the firm's independent and impartial opinions.

Glasgow, January 17, 1924.

THE past week has shown little improvement in the amount of business put through, although there has been a fair number of inquiries for export.

There is no change of importance to note, prices being fairly steady.

Industrial Chemicals

ACID ACETIC.—Glacial, 98/100%, £60 to £67 per ton; 80% pure, £49 to £51 per ton; 80% technical, £47 to £48 per ton, all packed in casks, delivered c.i.f. U.K. ports, duty free.

ACID BORACIC.—Crystals or granulated, £48 per ton; powdered, £50 per ton, carriage paid U.K. stations, minimum ton lots.

ACID CARBOLIC, ICE CRYSTALS.—In very poor demand, now quoted at about 11d. per lb., carriage paid.

ACID CITRIC, B.P. CRYSTALS.—Moderate inquiry. Price unchanged at about 1s. 4½d. per lb., less 5%, ex store.

ACID FORMIC, 85%.—Spot material still available at about £62 per ton, ex store.

ACID HYDROCHLORIC.—In little demand. Price 6s. 6d. per carboy, ex works.

ACID NITRIC, 80°, £23 10s. per ton, ex station, full truck loads.

ACID OXALIC.—Price remains unchanged at about 5¾d. per lb., ex store, but very little demand.

ACID SULPHURIC.—144°, £3 12s. 6d. per ton; 168°, £7 per ton, ex works, full truck loads. Dearsenicated quality, 20s. per ton more.

ACID TARTARIC, B.P. CRYSTALS.—Unchanged at about 1s. per lb., less 5% ex wharf.

ALUMINA, SULPHATE, 17/18%, IRON FREE.—Quoted £8 5s. per ton, c.i.f. U.K. port, prompt shipment. Spot lots obtainable at about £8 12s. 6d. per ton, ex store.

ALUM, CHROME.—Price unchanged at £26 to £28 per ton, according to quality, delivered f.o.b. U.K. port.

POTASH (LUMP).—Quoted £10 17s. 6d. per ton, f.o.b. U.K. port for export. Continental material on offer at about the same price, ex store.

AMMONIA, ANHYDROUS.—Unchanged at about 1s. 5d. per lb., ex station, prompt delivery.

AMMONIA CARBONATE.—Manufacturers advise advance in price. Lump now quoted £35 per ton. Powder, £37 per ton, carriage paid, packed in casks.

AMMONIA LIQUID, 880°.—Unchanged at 3d. per lb., delivered. Containers extra.

AMMONIA MURIATE.—Grey galvanisers' quality offered at £31 to £32 per ton, ex station, spot delivery. Fine white crystals quoted £27 15s. per ton, ex store.

ARSENIC, WHITE POWDERED.—Good export inquiry. Price now quoted, £70 per ton, f.o.b. U.K. ports. Spot lots unchanged at about £73 to £74 per ton, ex store. Offered from the continent at about £67 to £68 per ton, c.i.f. U.K. port.

BARIUM CHLORIDE, 98/100%.—In little demand. English material unchanged at about £15 per ton, ex store.

BARYTES.—Finest white English unchanged at £5 5s. per ton, ex works. Good quality continental material offered at £5 per ton, c.i.f. U.K. ports.

BLEACHING POWDER.—English makers' price now £11 per ton, ex station, spot delivery. Contracts 20s. per ton less.

BORAX.—Granulated, £24 10s. per ton; Crystal, £25 per ton; Powdered, £26 per ton, carriage paid U.K. stations, minimum ton lots.

CALCIUM CHLORIDE.—English material, £5 12s. 6d. per ton, ex station.

COPPERAS, GREEN.—Price about £2 5s. per ton, f.o.b. U.K. port in bulk. Packed in casks about £4 per ton, f.o.b.

COPPER SULPHATE.—Price unchanged at about £25 per ton, less 5% f.o.b. U.K. port.

FORMALDEHYDE 40%.—Quoted £63 per ton, ex store, spot delivery. In little demand.

GLAUBER SALTS.—Fine white crystals on offer at about £3 10s. per ton, ex wharf, spot delivery. Still offering from the continent at about £3 per ton, c.i.f. U.K. port.

LEAD, RED.—English makers' price nominally £45 per ton carriage paid U.K. station, but parcels can be obtained at considerably less. Continental now offered at about £36 10s. per ton, c.i.f. U.K. port. Spot material quoted £37 10s. per ton, ex store.

LEAD, WHITE.—Continental material on offer at about £41 per ton, ex store.

LEAD ACETATE, WHITE CRYSTALS.—Little spot material available. Quoted £46 5s. per ton, ex store. Brown about 20s. per ton less.

MAGNESITE, CALCINED.—Finest English material offered at £8 per ton, ex station.

MAGNESIUM CHLORIDE.—Spot material still available at about £3 17s. 6d. per ton, ex store. Continental offers of about £2 15s. per ton, c.i.f. U.K. port, prompt shipment.

MAGNESIUM SULPHATE (EPSOM SALTS).—Commercial quality offered at about £5 per ton, ex store. B.P. quality, £6 5s. per ton, ex station, prompt delivery.

POTASH CAUSTIC, 88/92%.—Price well maintained at about £34 per ton, ex store. Quoted from the Continent at £30 10s. per ton, c.i.f. U.K. port.

POTASSIUM BICHROMATE.—Unchanged at 5¾d. per lb., delivered.

POTASSIUM CARBONATE, 96/98%.—Quoted £29 per ton, ex store, spot delivery. Offered from the continent at about £26 10s. per ton, c.i.f. U.K. port.

POTASSIUM CHLORATE.—Little inquiry. Spot lots unchanged at about 3½d. per lb., ex store.

POTASSIUM NITRATE (Saltpetre).—Quoted £32 10s. per ton ex store, spot delivery. Offered for forward delivery from the continent at about £24 5s. per ton, c.i. f. U.K. port.

POTASSIUM PERMANGANATE, B.P. Crystals.—Unchanged at about 10½d. per lb., ex store, spot delivery.

POTASSIUM PRUSSIATE (Yellow).—Quoted 9¼d. per lb., f.o.b. U.K. port for export. Spot material available at about 10d. per lb., ex station.

SODA CAUSTIC.—76/77%, £19 7s. 6d. per ton; 70/72%, £17 17s. 6d. per ton; 60/62%, broken, £19 2s. 6d. per ton; 98/99%, powdered, £22 15s. per ton. All ex station spot delivery. Contracts 20s. per ton less.

SODIUM ACETATE.—Now quoted about £23 to £24 per ton, ex wharf, early delivery.

SODIUM BICARBONATE.—Refined recrystallised quality, £10 10s. per ton, ex quay or station, M.W. quality 30s. per ton less.

SODIUM CARBONATE.—Soda Crystals, £5 to £5 5s. per ton, ex quay or station. Alkali, 58%, £8 12s. 3d. per ton, ex quay or station.

SODIUM HYPOSULPHITE.—English makers' price about £10 per ton, ex station. Continental obtainable at about the same figure. Pea Crystals quoted £15 per ton, ex store.

SODIUM NITRATE, 100%—Quoted £26 10s. to £28 10s. per ton according to quantity, f.o.b. U.K. port.

SODIUM PRUSSIATE (Yellow).—Unchanged at about 5d. per lb., f.o.b. U.K. port for export. Spot material available at about 5¼d. per lb., ex store.

SODIUM SULPHATE (Saltcake).—Price for home consumption £4 5s. per ton, carriage paid stations. Good export inquiry.

SODIUM SULPHIDE.—60/62% solid, £15 per ton, ex station; broken, £1 per ton more; 31/34% crystals, £9 7s. 6d. per ton, ex station.

SULPHUR.—Flowers, £10 per ton; roll, £9 per ton; rock, £9 per ton; ground, £8 per ton. Prices nominal.

TIN CRYSTALS.—Quoted 1s. 3½d. per lb., f.o.b. U.K. port.

ZINC CHLORIDE, 98/100%—Unchanged at about £25 per ton, f.o.b. U.K. port.

ZINC SULPHATE.—Offered from the continent at about £12 10s. per ton, c.i.f. U.K. port.

NOTE.—The above prices are for bulk business and are not to be taken as applicable to small parcels.

Coal Tar Intermediates and Wood Distillation Products

BENZOIC ACID.—Fairly good home demand. Price 1s. 9d. lb., delivered.

BETA NAPHTHOL.—Moderate home demand. Price 1s. 1d. lb., delivered.

BI NITRO TOLUOL.—Some export inquiry. Price 1s. 0¾d. lb., f.o.b.

NAPHTHALENE DISULPHO ACID, 1 : 3 : 6.—Export inquiry. Price quoted 5s. 6d. lb. 100 % basis, f.o.b.

PHTHALIC ANHYDRIDE.—Good home demand. Price 2s. lb., delivered.

PICRAMINIC ACID.—Some export inquiry. Price 2s. 7d. lb. 100% basis, f.o.b.

PARA NITRO PHENOL.—Foreign inquiry. Price 2s. 2d. lb. 100% basis.

PARA NITRO TOLUOL.—Small inquiry. Price 2s. 3d. lb., delivered.

SULPHANILIC ACID.—Small home inquiries. Price 10½d. lb., delivered.

The Manchester Chemical Market

(FROM OUR OWN CORRESPONDENT.)

Manchester, January 17, 1924.

Buyers seem to have acquired a little more confidence or else the market is simply regaining the stride which had necessarily to be interrupted in the last week of the year. In any case there is again reported a slight addition to the volume of business done, with home buyers as well as for shipment. In one or two instances quotations have been shaded a little, but on the whole, compared with a week ago, values will be found to have been fairly well maintained.

Heavy Chemicals

Prussiate of soda is still quiet, although steadiness keeps up, offerings not being excessive. Soda crystals meet with a quietly steady demand at £5 5s. per ton. Quotations for sulphide of sodium show little change, 60–65 per cent. concentrated solid being on offer at £14 10s. to £15 and crystals at £9 ; business, however, has not improved much. Saltcake is selling fairly well for shipment and is in moderate demand on home trade account, with prices steady at £4 10s. per ton. Home and foreign inquiry for caustic soda keeps up, with 60 per cent. material quoted at £16 17s. 6d. and 76–77 per cent. at £19 7s. 6d. per ton. Alkali is steady and in fairly good demand at £7 per ton for 58 per cent. quality. Phosphate of soda is on offer at about £14 10s. per ton, with transactions on a small scale. Bleaching powder continues to be inquired for at round £10 per ton, in casks. Hyposulphite of soda is quiet but unchanged at £15 per ton for photographic crystals and £9 10s. per ton for commercial quality. Nitrite of soda continues in rather short supply and values are maintained at £28 10s. to £29 per ton. Bicarbonate of soda is steady and in moderate inquiry at £10 10s. per ton. Bichromate of soda is selling rather well at 4½d. per lb. Glauber salts are quiet but unchanged at £3 10s. per ton. Chlorate of soda also attracts little buying interest and prices are now about 2¾d. per lb. Acetate of soda is weaker again at £22 10s. to £23.

Caustic potash is steady and in rather good inquiry at £30 to £32 per ton for 90 per cent. strength. Carbonate of potash is quoted at round £27 per ton for 88–92 per cent. The demand for yellow prussiate of potash continues inactive and 8½d. per lb. is now being quoted. Chlorate of potash is only in moderate request and values are on the easy side at 2¾d. to 3d. per lb. Permanganate of potash is inactive at 8½d. to 9d.

Arsenic keeps fairly steady at £67 to £68 per ton for white powdered, Cornish makes, with a moderate amount of business being put through. Sulphate of copper is rather quiet at about £25 10s. per ton, f.o.b. Epsom salts are in quietly steady demand at £4 10s. per ton for commercial ; magnesium sulphate, B.P., is quoted at about £6 5s. per ton. Acetate of lead is maintained at £45 per ton both for white and brown qualities. Acetate of lime is quiet but fairly steady at £21 for grey and about £14 per ton for brown. Nitrate of lead is slightly lower at £43 per ton.

Acids and Tar Products

Tartaric acid is quoted at 1s 1½d. and citric at 1s. 4½d. per lb., but the demand is only moderate. Acetic acid is on offer at about £45 for 80 per cent. commercial and £65 for glacial. Oxalic continues dull and weak at 5½d. per lb.

Most of the coal-tar products lack both strength and animation. Pitch is still quiet and £4 10s. is about an average value. Creosote is moderately active at 9d. to 9½d. per gallon. Naphthalene is not meeting with much demand ; crude is quoted from £6 to £10 and refined at about £18 per ton. Solvent naphtha is quiet at about 1s. 1d. per gallon. Carbolic acid is weak and prices are nominal, demand being quiet, but supplies on the short side ; crude is 2s. 4d. per gallon and an average price for crystal is about 11d.

Chemicals and Rivers' Pollution

THE Standing Committee on Rivers' Pollution have issued an interim report describing the general results of their work and of the local surveys undertaken upon a number of English and Welsh rivers. The report deals at length with the sewage problem and its bearing on fish life, and in a chapter on the results of scientific research it is mentioned that experiments proved conclusively that washings from roads treated with asphaltic bitumen, free from tar, are harmless to fish and stream life. Experiments have been made with hydrochloric acid (muriatic acid or spirits of salts) as a typical acid, and sodium hydroxide (known commercially as caustic soda) as a typical alkali. The acid is extensively used in galvanising works for the pickling of iron, and the alkali is used in the manufacture of soap. It may be stated generally (says the report) that comparatively small concentrations of free acid or free alkali are harmful to fish, and doubtless also to other forms of stream life, and that in particular perch and roach (and probably all freshwater fish) are more sensitive to free acid than to the equivalent strength of free alkali. Fortunately free acid and free alkali are usually both easy of detection, by means of blue and red litmus, respectively, and easy of correction, for the simple reason that the salt produced by the proper addition of acid to alkali, or conversely, is harmless to stream life when adequately diluted and left approximately neutral.

Completion of the British Colour Index

THE Society of Dyers and Colourists of Bradford announce the completion of the British Colour Index, which covers 1,236 synthetic dyes and 87 natural dyes, mineral pigments, and so on, appearing under more than 20,000 trade names, all of them duly indexed. The cost of production has been over £5,500, and proof copies have been corrected by experts in all countries, save Germany, where dyes are made. Every possible means were used to persuade Germany to come in too, but, apparently after a meeting of their dyestuff manufacturers, they refused. With this one exception, proofs have been revised voluntarily by colour users, chemists, and others in all parts of the world, followed by a Revision Committee of British colour makers, consumers, and experts, who have worked with the editor, Dr. F. M. Rowe, of the Manchester College of Technology. Of the 100 or so colour-making firms whose dyes are dealt with, Belgium, Holland, Spain, Russia, and Czecho-Slovakia are represented by one firm apiece, other countries in their order being : Japan two, Italy three, Switzerland five, France seventeen, United States twenty-nine, Germany thirty-two and Great Britain thirty-five.

Oleum Distillation : Inquest on Process Man

AN inquiry was held by the Manchester City Coroner (Mr. C. W. W. Surridge) on Monday, January 14, into the death of John Henry Bowes, aged 50 years, of Burns Street, Bradford, Manchester. Bowes was employed as a process man at the works of the Clayton Aniline Co., Ltd. Evidence was given that he had complained to his wife of pains in his head, and had told her that he had had a dose of gas. The works manager stated that Bowes had never complained of being gassed. He was engaged in a process of oleum distillation, and as the whole of the plant was completely enclosed the process was not one in which masks were required. When the plant was working normally there were practically no fumes from it. The medical evidence showed that the man was suffering from chronic bronchitis and that that was the cause of death. A verdict of " Death from natural causes " was returned.

Company News

CANADIAN EXPLOSIVES CO.—A dividend of 1¾ per cent. has been declared for the quarter ended December 31 last on the 7 per cent. cumulative preferred shares.

JOHN KNIGHT, LTD.—The share transfer books were closed on January 18 and will remain closed until January 31, both days inclusive, for the preparation of dividend warrants.

CANADA CEMENT CO.—A dividend is announced on the common stock for the quarter to December 31 last at the rate of $1½ per share, payable on January 16. Last year a similar dividend was paid.

JURGENS, LTD.—The transfer books of the company, so far as relates to the guaranteed 7 per cent. cumulative participating preference shares, closed on January 18 and will remain closed until January 31, both days inclusive.

THE "SHELL" TRANSPORT AND TRADING CO., LTD.—The 7 per cent. second preference share transfer books will be closed from January 16 to January 31, both days inclusive, for the preparation of the half-yearly dividend warrants payable on February 1.

EASTMAN KODAK CO. OF NEW JERSEY.—The directors have declared the following dividends payable on April 1 to holders of record on February 29: Regular dividend of 1½ per cent. on preferred stock, regular dividend of $1.25 per share on common stock, and extra dividend of 75c. per share on common stock.

ELECTROLYTIC ZINC CO. OF AUSTRALASIA.—A dividend has been declared at the rate of 9 per cent. per annum for the six months ended December 31 last, on the issue (made in 1920) of 1,100,000 8 per cent. cumulative participating preference shares on the amounts paid up from the respective dates of payments on the 8 per cent. cumulative participating preference share, allotted (under option certificate rights) prior to December 31, 1923, and on the issued ordinary shares (this does not apply to deferred ordinary shares, which do not participate in dividends before July 31, 1925). The dividend is payable on March 5, 1924, to holders registered on February 6. For the six months to June 30, 1923, 8 per cent. per annum was paid on the ordinary shares.

CHAMPION AND SLEE, LTD.—At the annual general meeting held in London on Monday, January 14, the chairman (Mr. H. H. Slee), in the course of moving the adoption of the report and accounts, said that the legitimate vinegar trade was still considerably hampered by the depredations of "fakers," who made and sold an article, described as vinegar, which was nothing but a concoction of German acid, water and colouring. It was generally mixed together in sheds or back yards, employing but little capital and hardly any labour, and consequently helped to swell the number of unemployed. Unfortunately the Food Acts of this country were a long way behind those of other nations, and he hoped that some day the Ministry of Health would awaken to its responsibilities and amend such Acts by protecting the consuming public at large from adul terated commodities, and thus benefit honest industries.

Chemical Trade Inquiries

The following inquiries, abstracted from the "Board of Trade Journal," have been received at the Department of Overseas Trade (Development and Intelligence), 35, Old Queen Street, London, S.W.1. British firms may obtain the names and addresses of the inquirers by applying to the Department (quoting the reference number and country), except where otherwise stated.

DRUGS FOR PERU.—A British commission agent in Lima is desirous of obtaining the representation for Peru of a British drug house. (Reference No. 92.)

TAR AND TAR SUBSTITUTE REQUIRED IN SOUTH AFRICA.—H.M. Senior Trade Commissioner in South Africa has reported a call for tenders for the supply of 850 tons of tar or tar substitute. Tenders can be submitted in South Africa until noon on March 25, 1924. (Reference D.O.T. 12964/E.D./M.C./2.)

LINSEED OIL FOR SWEDEN.—A firm of commission agents in Gothenburg desires to secure the representation for Sweden of a British firm manufacturing and exporting linseed oil, boiled and raw. (Reference No. 82.)

DRUGS AND DRUGGISTS' SUNDRIES FOR SWITZERLAND.—An agent in Lausanne is desirous of obtaining the representation of British firms for the sale of drugs and druggists' sundries in Switzerland. (Reference No. 83.)

Contracts Open

Tenders are invited for the following articles. The latest dates for receiving tenders are, when available, given in parentheses:

SOUTHALL (Jan. 22).—Disinfectants (carbolic powder and acid), distilled tar, etc. Particulars and forms of tender from Mr. J. B. Thomson, Town Hall, Southall.

MANCHESTER (Jan. 21).—Mineral, heavy mineral, burning and paraffin oils. Particulars may be obtained upon application to Mr. R. Williamson, Town Hall, Manchester.

EDINBURGH (Jan. 23).—350,400 tons gas oil, suitable for use in a carburetted water gas plant, specific gravity from 850/870 degrees. For further information apply to the Engineer and Manager, 15, Calton Hill, Edinburgh.

CANTERBURY (Feb. 29).—Tar (dehydrated), creosote oil, disinfectants, motor oils and greases, crystal oil, and cleaning materials, soaps, etc. Form of tender will be forwarded by Mr. P. H. Warwick, Roads and Survey Committee, Canterbury, upon receipt of a stamped and addressed envelope.

LUTON (Jan. 26).—Tenders are invited for the fitting up of two laboratories, one for elementary physics and one for advanced chemistry, at the Luton Modern School. Drawings and specifications can be seen at the school in Park Square, Luton, or at the office of the County Surveyor, Shire Hall, Bedford.

Tariff Changes

KENYA, UGANDA, AND TANGANYIKA.—Coal tar has been added to the list of articles subject to 10 per cent. *ad valorem* import duty.

SUDAN.—The import of saccharin is now prohibited, except under licence.

BULGARIA.—The import of the following is now prohibited: —Volatile oils and aromatic products, natural or artificial, with certain exception; lead oxide (litharge); chromates and bichromates.

FINLAND.—The import duty on the following articles manufactured in the United Kingdom has been reduced by 50 per cent.:—Acetic ether; fruit ethers; etheric or esteric solutions in alcohol, and other unenumerated ethers or esters; bitter almond oil; terpineol, safrol and menthol; heliotropine, cumarine, musk, and other unspecified scented substances for use in the manufacture of perfumery; also other essential vegetable oils, natural or artificial, not specially mentioned in the Tariff.

"Chemical Age" Inquiry List

The following inquiries have been received from readers of "The Chemical Age." Replies addressed to the box number given below, c/o "The Chemical Age," 8, Bouverie Street, London, E.C.4, will be forwarded to the inquirers.

ASBESTOS PROTECTED METAL.—Particulars are wanted of manufacturers of "Asbestos Protected Metal" roofing material for chemical works.—No. H.33.

LAPIS LAZULI.—A firm in South America is anxious to be put into communication with one or two firms in England who would be interested in acquiring monthly a quantity of commercial lapis lazuli.—No. H.34.

Hardware Trade Journal Jubilee Number

The Hardware Trade Journal attains its jubilee next week, having first been published in 1874, and the event will be celebrated by a special jubilee number. This will contain a review of the trade during the last half century, which will be of importance to all those engaged in the hardware and allied trades. It is confidently claimed for the jubilee number that it will be an indispensable work of reference for many years to come. Twenty experts will contribute reviews of the progress and development of the industries concerned during the period of the journal's existence. There will appear about seventy pictures and character sketches of men and firms who have been engaged in the business for fifty years and over. Sir Ernest Benn will contribute an important article on the relations of capital and labour during the period under review, and Mr. H. P. Shapland, Chairman of the Design and Industries Association, will deal with the development of housing.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for any errors that may occur.

County Court Judgments

[*NOTE.—The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for damages or otherwise, and the result of bona-fide contested actions. But the Registry makes no distinction of the cases. Judgments are not returned to the Registry if satisfied in the Court books within twenty-one days. When a debtor has made arrangements with his creditors we do not report subsequent County Court judgments against him.*]

BOTANIC BUFFETS, LTD., 2, Myrtle Street, Liverpool, cordial manufacturers. (C.C., 19/1/24.) £26 19s. 8d. November 21.

POOLE, Mr. H., 122, Green Lanes, Tottenham, cleaner and dyer. (C.C., 19/1/24.) £14 10s. December 3.

UNCLE SAMS PICKLE AND SAUCE CO., Bayleys Yard, Smithfield Passage, Birmingham, pickle manufacturers. (C.C., 19/1/24.) £16 18s. 6d. November 29.

UNITED LABORATORIES AND CHEMICAL CO., LTD., 97, Queen Victoria Street, E.C., chemists. (C.C., 19/1/24.) £18 7s. 8d. October 25.

Deed of Arrangement

JOHNSON, Alf., Bromley Street, Clayton, and Silverdale, Grange Avenue, Levenshulme, chemical and colour merchant. (D.A., 19/1/24.) Filed January 12. Trustee, T. Dutton, Clarence Chambers, 4, Piccadilly, Manchester, I.A. Secured creditors, £7,920; liabilities, unsecured, £7,199; assets, less secured claims, £2,552.

Mortgages and Charges

[*NOTE.—The Companies Consolidation Act, of 1908, provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its Annual Summary, specify the total amount of debts due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.*]

CHEMICAL AND TECHNICAL ENGINEERING CO., LTD., London, E.C. (M., 19/1/24.) Registered January 4, £2,000 debentures (filed under section 93 (3) of the Companies (Consolidation) Act, 1908, present issue £700; general charge.

CHEMICAL ENGINEERING AND WILTON'S PATENT FURNACE CO., LTD., London, N.W. (M., 19/1/24.) Registered January 2. £500 debentures, balance of £3,000; general charge. *£5,250. December 27, 1922.

CHEMICAL INDUSTRIES, LTD., London, E.C. (M., 19/1/24.) Registered January 4, £100 debentures to W. R. Nicholson, 61/3, Scrutton Street, E.C., chemical merchant; general charge. *Nil. December 31, 1922.

CORBYN STACEY AND CO., LTD., London, E., chemists. (M., 19/1/24.) Registered January 4, £1,000 3rd debenture, to W. H. Robertson, Southbeech, Waldegrave Road, Bickley, chemist; general charge (subject to 1st debenture and 2nd debenture). *£750. May 3, 1923.

DIAMOND BRAND PRODUCTS, LTD., London, N., varnish manufacturers. (M., 19/1/24.) Registered January 4, £500 debentures (filed under sec. 93 (3) of the Companies (Consolidation) Act, 1908), present issue £200; general charge.

EGYPTIAN CENTRAL OILFIELDS, LTD., London, E.C. (M., 19/1/24.) Registered January 3, £4,000 debentures, part of £20,000; general charge. *£15,000. May 29, 1923.

FRANKLIN PROCESS, LTD., Manchester, dyers, bleachers, etc. (M., 19/1/24.) Registered January 7, £14,000 debentures (filed under sec. 93 (3) of the Companies (Consolidation) Act, 1908), present issue £4,000; general charge. *£9,650. March 22, 1923.

MARKHAM, SONS AND CO., LTD., Derby, disinfectant manufacturers. (M., 19/1/24.) Registered January 2, £2,000 mortgage, to Nottingham Ancient Imperial United Order of Oddfellows Friendly Society; charged on Agard Street Mills, Derby. *Nil. March 28, 1922.

SUTTON (W.) AND CO., DRUGGISTS' SUNDRIES, LONDON, LTD., London, E.C. (M., 19/1/24.) Registered January 1, £4,500 mortgage and Land Registry charge, to Brazilian Railways Trust, Ltd., 26, Theobalds Road, W.C.; charged on 76, 77 and 78, Chiswell Street, E.C. *——. October 4, 1922.

Satisfactions

BARNSLEY CHEMICAL CO., LTD. (M.S., 19/1/24.) Satisfaction registered January 4, £10,000, registered September 15, 1920.

BLEACHERS' ASSOCIATION, LTD., Manchester. (M.S., 19/1/24.) Satisfaction registered January 7, £75,000, balance of amount registered January 11, 1912.

CORBYN STACEY AND CO., LTD., London, E., chemists. (M.S., 19/1/24.) Satisfaction registered January 4, £1,500, registered June 4, 1923.

MARLEY HILL CHEMICAL CO., LTD. (M.S., 19/1/24.) Satisfaction registered January 8, £3,000, part of amount registered January 4, 1921.

RIPLEY PRESERVING CO., LTD., Ripley (Derby). (M.S., 19/1/24.) Satisfaction registered January 7, all moneys, etc., registered December 23, 1920.

UNITED PREMIER OIL AND CAKE CO., LTD., London, E.C. (M.S., 19/1/24.) Satisfaction registered January 7, £6,660, part of amount registered July 9, 1919.

London Gazette

Notice of Dividend

BOTTOMLEY, Thomas, Tannerfield Works, Hightown, Liversedge, chemical manufacturer. Supplemental dividend of 16s. 4d. per £, making 20s. in the £, and 4 per cent. interest, payable January 25, Official Receiver's offices, 12, Duke Street, Bradford.

New Companies Registered

BRITISH INDUSTRIAL ALCOHOL CO., LTD., 10, George Street, Hanover Square, London, W. Manufacturers, refiners, distillers and importers of alcohol of all kinds and its by-products, industrial chemists, etc. Nominal capital, £100 in 1s. shares.

ERNEST E. MAYER, FAWSITT AND CO., LTD., 6, Lloyd's Avenue, London E.C.3. Importers of and dealers in waxes, oils, soaps and chemicals of all kinds; candle and soap manufacturers, chemists, druggists, etc. Nominal capital, £45,000 in 44,000 7½ per cent. cumulative preference shares of £1 and 20,000 ordinary shares of 1s.

National Importance of the Chemical Industry

COLONEL SIR EDWARD A. BROTHERTON contributes to the annual trade review number of the *Yorkshire Post* an article dealing with the advance of the British chemical industry, in which he states that both the dyestuffs and fine chemical industries are essential to the country's welfare, and they are alike in that they depend for their existence upon profound chemical knowledge. More than that, they can continue to exist only by reaching out into the chemical unknown, and thus maintain and foster a large number of research chemists. The labours of these men increase the chemical potentiality of this country, and those who are unable to realise what this means to industry may, at all events, remember the enormous —even vital—part that chemistry played in the great war. Under the protection of the Dyestuffs Act, the industry now manufactures more than 80 per cent. of the colours required by other industries, and under the protection of the Safeguarding of Industries Act the fine chemical industry has grown to such extent that it now manufactures something like 1,500 products, as against 100 in pre-war days. These two industries alone probably employ twenty times the number of chemists which they employed in 1914; and all this high technical skill, all these trained minds, would be available if national emergency again demands their services.